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NATIONAL EVALUATION OF THE SCHEME OF
OPERATION BLACKBOARD

A STUDY OF BUILDING COMPONENT OF OPERATION BLACKBOARD SCHEME

Lathika Jaisingh

NATIONAL INSTITUTE OF EDUCATIONAL
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NEW DELHI, INDIA

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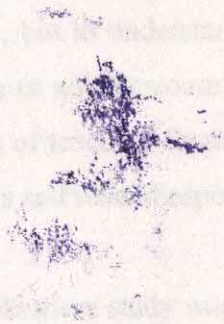

FOREWORD

This study was commissioned by the Ministry of Human Resource Development, Department of Education, Government of India (GoI) to have an objective feedback on the existing schooling facilities in primary schools in the country, especially after the implementation of the Scheme of 'Operation Blackboard' (OB), which was launched in 1987-88. The OB aimed at providing basic schooling facilities in every primary school, that is, a minimum of two teachers, two all-weather classrooms, a varandah, toilet facilities for boys and girls separately and a set of teaching learning materials and blackboards in all those primary schools which did not have these basic facilities in 1986. The GoI was keen to have the impact of the scheme evaluated.

In view of various other interventions as a follow-up of the National Policy on Education (NPE) 1986 and its Programme of Action (POA), and especially after launching the internationally funded projects for school improvement and development programmes in early nineties, it was consciously decided not to undertake "evaluation" of the impact of the OB scheme, but to understand the implementation aspect in terms of progress in reduction of single or no classroom or no building schools, schools with less than two teachers, availability of teaching-learning-materials provided under the scheme and their utilisation by teachers and related aspects.

Accordingly, a comprehensive study was designed to meet the requirements of the GoI. A nation-wide sample survey was carried out to understand the ground realities of OB implementation covering all 25 states (as in 1999-2000) and 3 union territories, visiting over 7,700 primary schools located in community development blocks in the country. Selected thematic studies were undertaken to gain insights in the processes followed to manage financial assistance provided by the GoI to the states, building construction component, and selection and procurement of teaching-learning-materials. Special investigations were carried out to see the utility of special teacher training programmes and the relevance of instructional kits provided to schools in the context of primary stage curriculum. Case studies were attempted to understand field dynamics

between and within school functionaries and stakeholders in village community, related to education in general and primary school in the village in particular. A synthesis of 28 survey related studies on the implementation of OB Scheme in 25 States and three Union Territories as well as the highlights of selected theme based investigations have been documented and published as a series of documents. The present document forms a part of this series.

Findings of studies mentioned above were shared in a seminar held on 25-26 February 2002 which was attended by representatives of central and state government officials associated with the implementation of OB scheme, contributors of various studies undertaken and selected professionals active in education.

This report is the outcome of the efforts made by NIEPA in collaboration with various experts and institutions in the country to realise the above stated purpose of the study. But the sole credit for the execution of the multi-site study involving a wide range of partners goes to Professor Kuldip Kumar. Let me record my deep sense of appreciation and gratefulness to Professor Kumar for coordinating project implementation throughout the country and also for preparing the National Synthesis Report. In this work, he was ably assisted by Dr. Mona Sedwal, Project Associate Fellow, Mr. Hemant K. Panda, Project Assistant and Ms. Rajni Soni, Project Typist. I record my thanks to Director, NIEPA who took personal interest in the implementation of the Project and provided unflinching support at every stage of its execution. Being a national level study the total size of the Project was very large and involved huge administrative and financial operations at the Institute, which were carried out by NIEPA administration with a sense of commitment and efficiency. I acknowledge this full support and cooperation extended by the Registrar and other members of the Administrative Staff of NIEPA. Finally, let me also thank all the members of the Project Advisory Committee and other professionals who guided us from time to time in designing and implementing the Project.

R. Govinda
Project Director

PREFACE

The Operation Blackboard scheme was started in the country in 1987-88 and has made considerable progress. National Institute of Educational Planning and Administration (NIEPA) has taken up a project to study the implementation and impact of OB Scheme. In turn, NIEPA has sponsored the study of building component of OB scheme to Central Building Research Institute (CBRI), Roorkee. CBRI has conducted detailed survey of 500 schools selected at random from five states viz. Andhra Pradesh, Haryana, Madhya Pradesh, Uttar Pradesh and West Bengal to collect information related to structural and constructional aspects, functional performance, general acceptance, opinion of students and teachers and observations of survey team. The data was compiled, and documentation, critical examination, analysis and interpretation were carried out. This report gives the findings of the study. The report has been presented in six parts including a preamble and one part each devoted to each of the five states. It is hoped that NIEPA will find the report useful.

R. N. Iyengar
Director
CBRI, Roorkee

ACKNOWLEDGEMENTS

The study of 'Building Component of OB Scheme' was sponsored by National Institute of Educational Planning and Administration (NIEPA), New Delhi. CBRI is thankful to NIEPA for the confidence shown by them on the technical capability of the Institute. During the formulation of the project, the team members had very useful discussions with Prof. B.P. Khandelwal, Director, NIEPA, Prof. R. Govinda, Senior Fellow and Head, School and Non Formal Education Unit, NIEPA and Prof. Kuldeep Kumar, Consultant. The valuable contributions made by them are gratefully acknowledged. The project team is thankful to Prof. R.N. Iyengar, Director, CBRI for the advice and inspiration given to the team. The survey work would not have been possible, but for the cooperation and help, provided by thousands of school children, teachers and village functionaries, spread over the five states. Officers and staff of the Education Departments in the five states have also extended help to the Project Team. We are thankful to all of them.

Lathika Jaisingh
Project Leader
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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1. The objective of the study of 'Building Component of OB Scheme' was to survey 500 primary schools constructed under OB scheme, selected from five States, to collect data on building spaces and efficiency, structural and constructional aspects, functional performance general acceptance, opinion of students and teachers and observation of the survey teams, compilation, analysis and interpretation of data and submission of details report.

2. Five states i.e. Andhra Pradesh, Haryana, M.P., U.P., and West Bengal were selected for survey to represent areas having variations in geography and climate. These five states have plains, hilly terrains, areas experiencing heavy to no snow fall and heavy to light rain fall, coastal climate and different seismic zones. Also, there are a variety of construction materials and construction technologies available in these five states.

3. To collect the data, a detailed proforma was prepared in consultation with NIEPA. NIEPA had supplied the list of OB schools in Haryana, M.P., U.P., and West Bengal and list of OB schools in Andhra Pradesh was collected from the State Educational Authorities, In each State, districts/blocks to be surveyed were selected in such a way that the characteristics of each State like different terrains, materials of construction, construction practices, seismic zones are covered, as far as possible. Only OB schools in the chosen districts/blocks were selected. Survey of schools in Haryana and U.P. were conducted by 6 teams of Scientists and technicians, posted at Roorkee while the survey in Andhra Pradesh, M.P. and West Bengal was conducted by the staff of Extension Centres, of CBRI in the respective States. In Andhra Pradesh each school had a plaque showing the date of inauguration of the school, whether it was constructed under OB/non-OB schemes was decided based on the discussion with the teachers/villagers.

4. 521 primary schools, selected from the 5 states were surveyed. The criteria for selection of schools in each state was as discussed in the preceding point. The list includes 105 schools from 4 districts of Andhra Pradesh, 83 schools from 2 districts of Haryana, 122 schools from 5 districts of M.P., 118 schools from 4 district of U.P. and 93 schools from 3 districts of West Bengal.

5. The schools are located upto 12 Km from the main road. The access to almost all the schools was found to be 'Kutcha'. In remote villages in hilly terrain, though the children belonged to the local village or the adjacent one, the teachers, who could not find suitable accommodation in the village, had to trek daily several kilometers to attend the school.

6. The number of classrooms per school varied from 1 to 5, in case of schools with more than 2 rooms, additional rooms have been constructed under non-OB schemes. Most of the schools had verandah. In a few schools, one room is used as office/teachers room. Except in extreme climates, the classes are held in the verandah or in the open. However, in some cases, two classes are held in same room, causing disturbance to the students.

7. In Andhra Pradesh 65% of the schools surveyed had one classroom plus a verandah while 35% of the schools had one classroom, one office and a verandah. Haryana had bigger schools; 60% of them had 1 to 3 rooms and 40% had 5 or more rooms. In M.P., 8% of schools had one room and verandah, 24% schools had two rooms and verandah and 68% schools had more than 2 rooms. In U.P. 80% of the schools are having two classrooms, an office/principal's room and a verandah. In West Bengal, 31% schools had one classroom plus verandah, 30% had two classrooms plus verandah and 39% schools had more than 2 rooms.

8. The enrolment in the schools surveyed varied form a minimum of 14 in village Kandal of Block Jakhnidhar in District Tehri Garhwal in U.P. to a maximum of 528 in village Panwari of Block in District Hamirpur in U.P.

9. In all the schools surveyed, classes are held with the children sitting on the floor/ground. The minimum space requirement for classrooms with children squatting on the floor is 0.73 sq. m. per student. It was found that 37% schools in Andhra Pradesh, 33% schools in Haryana, 62% schools in M.P., 54% in U.P. and 84% schools in West Bengal, do not satisfy the minimum space requirement.

10. One of the building component requirements of schools in OB scheme is provision of a deep verandah. It was found that in West Bengal 87% schools had width of verandah less than 2.4m. In other states the requirement was not satisfied in 5 to 24% of the schools.

11. About 10% of the schools did not have the provision for drinking water.

12. One of the major shortcomings of the schools, revealed by the survey, is gross inadequacy of toilets in them. It was seen that toilet facilities have been provided only in 31% schools in Andhra Pradesh, 23% schools in Haryana, 10% schools in M.P., 29% schools in U.P. and 31% schools in West Bengal.

13. For adequate natural lighting in classrooms, in minimum area of windows required is 15% of the floor area of the classroom. It was found that in 70% of schools in Andhra Pradesh, 80% schools in Haryana, 23% schools in M.P., 15% schools in U.P. and 50% schools in West Bengal, window openings, to provide natural light, were adequate.

14. The desirable orientation of school buildings is North-South. Survey revealed that, only 45% schools in Andhra Pradesh, 9% schools in Haryana, 19% schools in M.P., 22% schools in U.P. and 59% schools in West Bengal are having the most desirable orientation.

15. 90% of the schools do not have built in storage space in classrooms to keep books etc. However there are steel almirahs and wooden/steel boxes in teacher's room to keep teaching/sports goods.

16. In almost 95% of the schools surveyed in the 5 States, visibility of blackboard and audibility at the last row of students are proper. There is no glare at the blackboard.

17. Locally available materials and construction technologies have been used in the construction of schools in all states. Random rubble/coursed rubble masonry has been used in foundation and plinth and brickwork/R.R. masonry in cement mortar for walls in Andhra Pradesh All the schools surveyed in the State had Cuddapah stones for flooring and flat RCC roofs and 83% schools had wooden frames and shutters for doors/windows. In Haryana brick work in cement/mud mortar is the prevalent material of construction for foundation, plinth and walls and flooring is of cement concrete. Roofs are made flat with RCC or stone patties and wood is used for joinery. Steel frames for doors and windows are finding way in new constructions. In M.P. the most commonly used materials are brickwork in cement mortar for foundation, plinth and walls, cement concrete for flooring, RCC for flat roofs, country tiles for sloping roofs and wood for joinery. Undreamed pile foundation, developed by CBRI, has been used in areas having expansive soil. Stone patties have been used for roofs, in area where they are locally available. In U.P., foundation, plinth and walls are constructed mostly in brickwork in cement/mud mortar, except in hilly terrain like Tehri Garhwal, where stones are used. Cement concrete is the common material for flooring and RCC for flat roofs except in District Faizabad where brick paving and RBC roofs are common. Wood, which as used for joinery earlier, is being replaced by steel frame in newer constructions. In West Bengal, the most common material for construction of foundation, plinth and walls is brickwork in cement mortar, wood for joinery and cement concrete for flooring. Flat RCC roofs and sloping roofs

with GI/AC sheets/tiles are all used in the State, depending upon the intensity of rainfall in the area.

18. The structural condition of the buildings in Andhra Pradesh varies from satisfactory to good. In Haryana, about 79% of schools surveyed are in good condition. However 3 schools in Yamunanagar District have serious structural distress. Out of the schools inspected in M.P. 16% are in good condition and 72% in satisfactory condition. 50% of schools in Gwalior District are in distressed condition while 13% schools in Indore District had to be abandoned due to severe structural distress. In U.P., expect in Nainital District the structural condition of schools is not good. 55% school buildings in Tehri Garhwal District, are in distressed condition, 14% buildings in Hamirpur are in severely distressed condition and in Faizabad 8% school buildings had to be abandoned. In West Bengal only about 50% of the schools are in good condition. Leakages from roof, dampness in wall, dampness rising from ground in buildings located at low-lying areas is common problems observed in many of the buildings. Cracks in walls and roofs due to unequal settlement of foundation are serious problems noticed in some of the buildings. Corrosion of reinforcement and spalling of concrete at the ceiling of slabs/beams are signs of major structural distress noticed in some of the buildings.

19. Bhiwani and Yamuanagar Districts of Haryana, Nainital and Garhwal Districts of U.P. and Jalpaiguri and Maldah Districts of West Bengal, fall under seismic zone IV. For buildings to be constructed in high seismic zones, earthquake resistant measures such as provision of RC bands at lintel and plinth level and vertical reinforcement at corners and junctions of walls should have been provided. All the school buildings are structurally deficient in this respect.

20. Most of the teachers consider the schools to be functionally satisfactory, except for the facility of toilets drinking water and furniture for teachers. In single teacher schools requirement of another teacher was put up, as the school has to be

closed, when the teacher is on leave or has to go for other duties such as collecting pay, or participation in census work, election, immunization programme etc. Lady teachers were resenting their posting to schools in remote hilly areas, as they have to trek daily several kilometers to attend the school.

21. Among the schools surveyed most of the OB schools have been constructed during 1990-97.

22. For proper upkeep, appearance, functional utility and prolonged life, regular maintenance of the building is essential. Huge investment made in the building stock, can be retained only if the building are maintained properly. Unfortunately in none of the states, where the survey was carried out, system appears to exist for the maintenance of school buildings.

PART I
INTRODUCTION

As a follow up of National Policy on Education, 1986, the scheme Operation Blackboard (OB) was launched in 1987 – 88 to improve educational facilities in primary schools in the country. The OB scheme since its inception has been making progress in terms of provision of teachers, teaching and learning material and construction of two-room school building with a verandah and toilet facilities for boys and girls. Nearly Rs. 2000 Crores has been spent over the last ten years for the building component of the scheme.

RERQUIREMENTS OF BUILDINGS

As per the 'The Scheme of Operation Blackboard' one of the essential requirements for primary school building is provision of at least two reasonably large rooms that are usable in all weather with a deep verandah along with separate toilet facilities for boys and girls.

- Each of the rooms to be constructed should be approximately 30 sq. mtrs. in area and should have verandah of approximately 9-10 feet depth. Even if there are two rooms in existence in present, but their area is much less and they are not satisfactory, new rooms may be constructed.

- Provision of separate toilet for boys and girls must form part of the construction activity. Toilets should be so constructed that they inculcate desired toilet habits among children and the construction and maintenance of toilets should be such that it should be possible to keep them clean.

- Each state government should get good architectural design made for construction of primary school buildings. These designs should be modular, in that they should provide scope for expansion of the building programme. Every effort should be made to utilize **local materials and keep the cost of building low**. They should be adequate, without being ostentatious and should merge well with the village environment. It should also be

ensured that there is built-in space for storage of equipment, and well-plastered blackboards should also form part of the structure, itself, in the rooms as well as at both ends of the verandah.

OBJECTIVES

To survey 500 primary schools constructed under Operation Blackboard scheme, selected from five sates i.e. Andhra Pradesh, Haryana, Madhya Pradesh, Uttar Pradesh and West Bengal, to collect information data related to the under mentioned parameters and compilations, documentation, critical examination, analysis and interpretation of the data and submission of a detailed report giving the findings of the study to NIEPA.

- ✓ Building spaces and efficiency.
- ✓ Structural and constructional aspects.
- ✓ Functional performance.
- ✓ General acceptance.
- ✓ Opinion of students and teachers.
- ✓ Observations of the survey teams.

SCOPE OF WORK

The detailed scope of work of the project is given below.

- ❖ Preparation of a detailed proforma to collect information/data.
- ❖ Carry out survey of 500 selected schools, located in 5 states.
- ❖ Compilation and documentation of the data.
- ❖ Critical examination, analysis and interpretation of the data.
- ❖ Preparation of a detailed report giving the findings of the study.
- ❖ Submission of the report to NIEPA.

PROFORMA FOR DATA COLLECTION

To collect data, a detailed proforma was prepared and is given in Appendix. The proforma aims at collecting data in the following areas.

I Structural and Constructional Aspects

The data collection is aimed at obtaining details regarding the type of construction and the specification adopted for each element of the building like foundation, walls, floors, doors, windows, roofs etc, materials used for the construction for different elements including the use of local material and quality of construction.

II Functional Performance

The questions related to leakage, dampness etc. is to assess the performance of the building and the adequacy of periodical maintenance done, if any. If there is leakage/dampness and no care is taken to check it, there will be adverse effect to the life of the building. A damp building is also unhealthy and unhygienic. The study is also aimed at commending on the structural safety of the building. Cracks in slabs/walls, excessive deflection in slab or corrosion of reinforcement are signs of deterioration. Depending on the position and extent of cracks and other signs of distress, an assessment of structural soundness of the building could be made. The questions on water logging, plinth heights etc. are to assess whether there is proper drainage around the school.

III, IV, V General Condition/Teachers/Students Opinion

These parts of proforma are aimed at assessing the overall condition of the building and also to collect the viewpoint of the users i.e. teachers and students and of a third party i.e. the survey team on how far the aspiration of the users have been fulfilled by the designs, as executed and maintained at the site.

VI Building Space and Efficiency

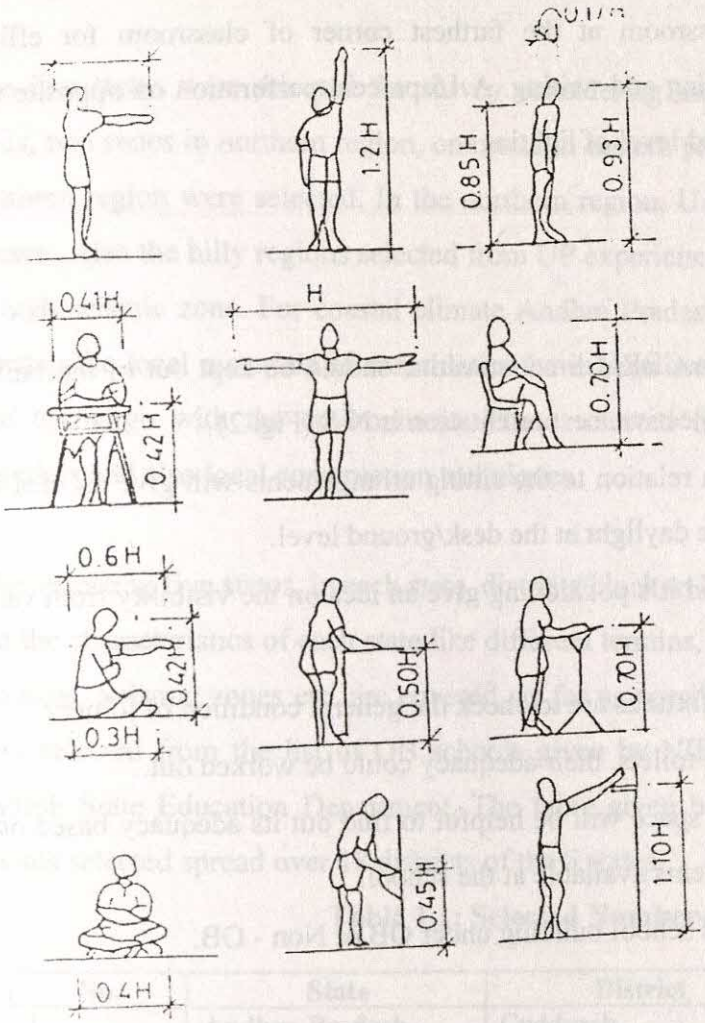
The objective of this part of the proforma is to gather information of the under mentioned aspects.

- Whether constructed under OB or Non-OB scheme.
- Location of school with respect to village centre.
- Age of the building/buildings.
- Community participation, if any, for construction of school and/or development of infrastructure.
- Number of classrooms and dimensions.

Dimensional data on classrooms will help in assessing the area provided per child and whether the area of class room is sufficient of the number of students based on the sitting arrangement i.e. squatting on the ground or sitting with furniture. In Indian school system 40 students per class has been commonly accepted as a standard for planning. The anthropometric studies of students govern the design of school buildings, furniture sand equipment. The Indian Council of Medical Research formulated three basic dimensions of standing height, sitting height and hip width after extensive survey and study in different regions of the country. The study conducted by the CBRI on the subject further extended the range of dimensions and relationship of body measurement and interpretation of data in terms of furniture and equipment on school design to cover various activities and posture (Fig. 1) to arrive at appropriate dimensions for functional and economical school spaces. To arrive at a suitable size and shape of classroom, the following factors were considered critical.

a. Basic dimensions of children and their space requirements
b. Dimensions, incidence and arrangement of furniture and equipment
c. Number of students to be accommodated
d. Diverse seating arrangement essential for these activities

Figure 1: Anthropometrics: Co relation of Body Measurement



STANDING HEIGHT

Age in Year	Height in mm.		
	Boys	**Girls**	**Mean**
5	1016	1016	1016
6	1079	1079	1079
7	1134	1134	1134
8	1187	1187	1187
9	1233	1233	1233
10	1284	1284	1284
11	1334	1334	1334
12	1386	1386	1386

Srivastava, R.D., *School Buildings, Design and Construction.* CBRI, 1991.

Investigation on the above led to the space requirement for seating and internal movement, the size of furniture and the minimum width of gangways. With these basic data, various seating configurations were worked out for formal and group activities for 40 students and its effect on audibility, angle of vision on chalk board, usefulness of wall area for display purposes, unused area per pupil, the perimeter of the wall, structural economy and lighting efficiency. On the basis of the anthropometric study, the area/child in classroom is worked as 0.73 sq. m in squatting system.

- From the window dimensions, the area of openings as a percentage of the area of classroom could be worked out and this is an indirect measure to judge the availability of natural

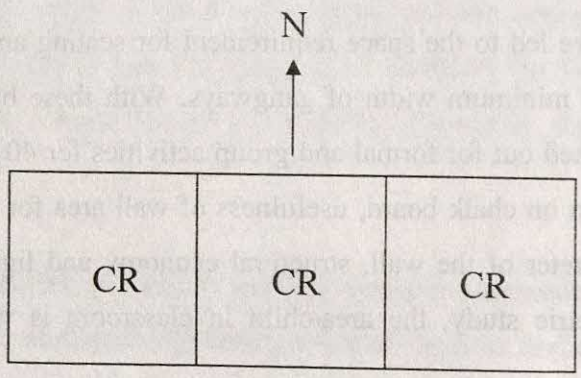
light in the classroom. The study on lighting efficiency indicate that minimum lighting level of 150 lux must be provided in classroom at the farthest corner of classroom for efficient performance of the activities of reading and writing. A 15 percent perforation on opposite walls was found adequate to provide desired level of lighting.

- Orientation of building

According to the study carried out in CBRI, direct sunshine should be kept out of the building during daytime and to achieve this objective, best orientation is N-S (Fig. 2)

- The sitting of the windows in relation to the sitting arrangements will give an idea from which side the students get the daylight at the desk/ground level.
- The size of the black board and it's positioning give an idea on the visibility from various positions, in the class.
- The questions on fittings and fixtures are to check the general condition of joinery.
- From the data collected on the toilets, their adequacy could be worked out.
- The data collected on storage space will be helpful to find out its adequacy based on the teaching materials and other items available at the school.
- Data regarding construction of school building under OB or Non - OB.

Figure 2: Best Orientation for School



This was recorded based on the information provided by the headmaster or teachers present on duty or discussion with the villagers during the survey. Rest of the data is based on the actual measurement or observation.

SAMPLE FOR SURVEY

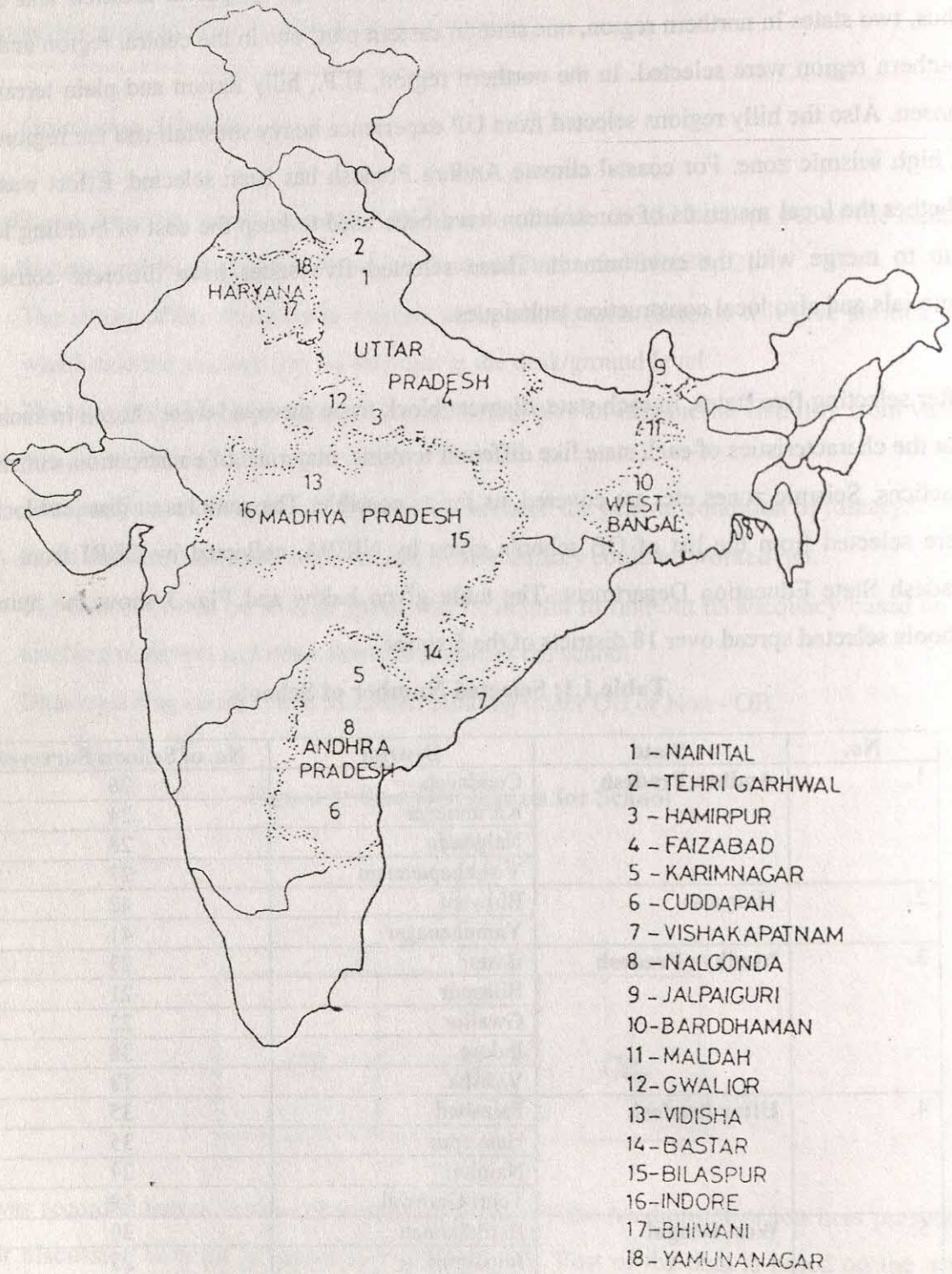
The five states were selected for survey considering their geographical location and climate. Thus, two states in northern region, one state in eastern part, one in the central region and one in southern region were selected. In the northern region, U.P., hilly terrain and plain terrain were chosen. Also the hilly regions selected from UP experience heavy snowfall and the region comes in high seismic zone. For coastal climate Andhra Pradesh has been selected. Effort was to see whether the local materials of construction have been used to keep the cost of building low and also to merge with the environment. These selected five states have different construction materials and also local construction techniques.

After selecting five states, in each state, districts/block to be surveyed were chosen in such a way that the characteristics of each state like different terrains, materials of construction, construction practices. Seismic zones etc. are covered, as far as possible. The samples at district/block level were selected from the list of OB schools given by NIEPA, collected by CBRI from Andhra Pradesh State Education Department. The table given below and Fig. 3 show the number of schools selected spread over 18 districts of the 5 states.

Table 1.1: Selected Number of Schools

No.	State	District	No. of Schools Surveyed
1.	**Andhra Pradesh**	Cuddapah	26
		Karimnagar	24
		Nalgonda	28
		Vishkhapatanam	27
2.	**Haryana**	Bhiwani	42
		Yamunanagar	41
3.	**Madhya Pradesh**	Bastar	23
		Bilaspur	21
		Gwalior	22
		Indore	38
		Vidisha	18
4.	**Uttar Pradesh**	Faizabad	35
		Hamirpur	35
		Nainital	29
		Tehri Garhwal	19
5.	**West Bengal**	Barddhaman	30
		Jalpaiguri	25
		Maldah	38
Total No.	**5**	**18**	**521**

Figure 3: Districts Selected For Survey of OB Schools



ORGANISATION OF REPORT

The report is in six parts. Part-I is the preamble while parts II, III, IV, V and VI cover the states of Andhra Pradesh, Haryana, M.P., U.P., and West Bengal respectively.

The maximum, minimum and average enrolment in schools for each district along with the percentage of classrooms having less than 30 sq. m. area has been given district wise in the following table. There is a need to construct more classrooms in those schools.

Table 1.2: Enrolment And Size Of Rooms & Verandah In Schools

State	District	Maximum Enrolment	Minimum Enrolment	Average Enrolmen	Area of room < 30sq.m	Width of ver. < 2.4m
AP	Cuddapah	387	29	151	43%	8%
	Karimnasar	175	25	97	70%	15%
	Naigonda	263	23	144	22%	14%
	Vishakhapatnam	489	30	132	54%	4%
Haryana	Bhiwani	332	44	158	40%	6%
	Yamunanagar	246	17	105	41%	4%
MP	Bastar	211	50	113	100%	37%
	Bilaspur	321	25	117	94%	20%
	Gwalior	280	101	178	100%	20%
	Indore	394	25	126	78%	15%
	Vidisha	318	36	126	95%	24%
UP	Faizabad	463	96	216	74%	3%
	Hamirpur	528	29	159	88%	9%
	Nainital	372	22	132	88%	4%
	Tehri garhwal	144	14	56	98%	7%
WB	Barddhaman	515	46	168	77%	85%
	Jalpaiguri	422	50	171	50%	84%
	Maldah	463	29	158	73%	95%

PART II

ANDHRA PRADESH

CUDDAPAH

Cuddapah district is located in the southern part of Andhra Pradesh in the Rayalaseema area bordering on the west by Ananthapur, north by Kurnool, on south by Chittor and on the east by Nellore districts. The district extents to an area of 15,359 sq. km. and has a population of 22,67,769. A good network of rail and road connect the district to Madras and Bombay. The economy of the district is predominantly agricultural and about 70% of its population is engaged in agricultural and allied activities. The predominant soils of the district are black clay, black loam, red loam, red sand and red clay. There are 50 mandals with 880 villages and the density of population is 148 persons per sq. km. There are 2626 primary schools in the district with overall enrolment of 128209 students and literacy rate is 48.12%.

26 school buildings constructed under OB scheme in 9 mandals were surveyed as per list given below.

Table 2.1: Number of Schools Surveyed

Name of Mandal	No. of Schools Surveyed
Chennur	4
Mydukur	4
Chapadu	3
Rajupalem	2
Proddutur	2
Vempalli	4
Ramapuram	2
Chintakommaladinne	2
Rajampet	3
Total No. of schools surveyed	26

Total No. of OB schools sanctioned for construction in the district - 1257

Total No. of OB schools constructed in the district - 1060

District education officer, Cuddapah, provided necessary information by providing list of OB schools in the mandals with location map. The teachers of the schools cooperated by providing necessary information. 90% of the villages are connected by good roads and 10% are of kachha

roads and are located in the interior of the district. All the old schools were constructed with locally available stones, and the recent constructions are with bricks.

General Observations

65% of OB schools are constructed with brick walls. Almost 35% of schools are of framed structure. The foundation and plinth are of locally available stone. The superstructure is of 37cm thick load bearing brick wall or RCC framed structure with 23cm thick non-load bearing brick walls. In 5 schools RC plinth beam is provided above coursed rubble stone. The flooring is of Cuddapah stone slabs. In general quality of construction is good.

About 73% schools are having one classroom with a verandah. Squatting system has been used for sitting in classroom. Maximum enrolment in school is 387. 42% schools have enrolment less than 100 and 26% schools have students more than 200. Minimum enrolment in the school is 29. 25% schools have less than 50 students. In 40% schools, area/student in class is less than 0.73% sq.m. which is the minimum as per space standard. 70% schools have proper daylight inside classrooms. Storage space is not provided in 90% schools. 60% schools have east west orientation though the best orientation for schools is North - South. More than 90% schools have no toilet in schools for boys and girls.

Karimnagar

Karimnagar district is located in the northern part of Andhra Pradesh in Telengana region. The district is bounded on the north by Adilabad, on north west by Nizamabad on the west by Medak district, on the south by Warangal district and the east by Godavari river. It extends over an area of 11,824 sqm. and has a population of 30,37486. There are 56 mandals with 1047 villages and the population density is 257 persons per sqm. There are 1596 primary schools in the district with overall enrolment of 20,6113. Literacy rate is 37.17%. The soil is predominantly red, constituting 73% and 27% is black cotton. 75% of the population is engaged in agricultural activities. 24 school buildings constructed under OB scheme in 8 mandals were surveyed as per list given below.

Table 2.2: Number of Schools Surveyed

Name of Mandal	No. of Schools Surveyed
Manakondur	3
Veenavanka	3
Koheda	3
Jamrnikunta	3
Chandurti	2
Kodimial	4
Ramadugu	2
Malhararao	4
Total No. of schools surveyed	**24**

Total No. of OB schools sanctioned for construction in the district - 940

Total No. of OB schools constructed in the district - 881

Disrict Education officer, Karimnagar provided necessary help by providing the list of schools in the mandals with location map. The teachers of all the schools cooperated by providing necessary information.

During the period of survey the district was in the grip of tension with naxalite activities due to the death of their leaders in police encounter. Malhar Rao mandal is located in the troubled area, having forests and hilly terrain with bad approach roads. In spite of these difficulties four schools were surveyed in this mandal on construction.

General Observations

Panchayat Raj Engineering Department of Govt. of A.P. constructed almost all the OB school buildings in the district. Since 1995 additional classrooms are under construction under DPEP scheme. In this scheme the construction work is taken up by village school committees, formed by the Government.

About 67% of school buildings arc having one-classrooms with attached verandah and 33% schools have one classroom with office and verandah. All OB school buildings are constructed with coursed rubble masonry for foundation and plinth. The walls are of brick. Out of 24 schools

surveyed 22 are having window/door frame in wood. In two schools there are steel frames fixed but no shutters given. The roof is of flat RCC for all cases. The flooring is of stone slabs. The general quality of construction is satisfactory. The maintenance of schools is inadequate and some urgent action is needed for periodic maintenance of school buildings to enhance the life and quality of the building.

In this district maximum enrolment in schools is 175. Only 30% schools have students more than 100. 60% schools have area more than 0.73sq.m/student in class, which is the minimum recommended in squatting system. 65% schools have proper daylight in the classrooms, having window area more than 15% of floor area. 50% schools have East - West orientation though for schools North - South is the best orientation recommended. Storage space in class is not provided in 80% schools. More than 90% schools have toilet.

Nalgonda

Nalgonda district is located in the central part of Andhra Pradesh in Telengana region adjoining Hyderabad. The district is bounded by Madek and Warengal in the north, Guntur and Mahaboobnagar in south, Khammam and Krishna in east and Ranga Reddy and Mahaboobnagar districts in west. It extends over an area of 14,240 sq.km. Black cotton soil forms about 9%, mostly on the banks of Krishna river in isolated patches. There are 59 mandals with 1129 villages and the population density is 200 persons/sq.km. There are 1834 primary schools working in the district with overall enrolment of 14,2009 students. The literacy rate in the district is 38%. The district is industrially developing due to its proximity to state capital Hyderabad and also due to cement industry as there are number of plants located in the district, since lime stone is available in abundant. Nagarjuna Sagar dam is located in the district.

28 school buildings constructed under OB scheme in 10 mandals were surveyed as per list given below.

Table 2.3: Number of Schools Surveyed

Name of Mandal	No. of Schools Surveyed
Pochampalli	4
Atmakur	3
Motkur	3
Shaligouraram	2
Anumula	3
Nidamanur	3
Tripuraram	3
Chivemela	3
Nadigudem	2
Kodad	2
Total No. of schools surveyed	**28**

Total No. of OB schools sanctioned for construction in the district - 1071

Total No. of OB schools constructed in the district - 990

District Educational officer Nalgonda provided necessary help by providing the list of schools and location guidance. The teachers of all the schools have cooperated by providing necessary information during survey.

The schools are located in interior villages consisting of some Harijan wadas (SC colonies) and Lambada Tandas (gypsies settlement).

General Observations

Out of the 28 schools surveyed 18 schools are with one classroom, office and verandah where as 10 schools are with one classroom and verandah. Recently DPEP school buildings are under construction by forming local village school committees, who will supervise the construction work. OB school buildings were constructed by Panchayati Raj Engineering Department of Govt. of A.P. Coursed rubble stone masonry has been adopted in foundation and basement and burnt clay bricks are used in walls for all the schools. The roof is of flat RCC. Cuddapah stone slabs are used for flooring in all schools. Out of the 28 schools surveyed, in 20 schools the frames and shutters of the door/windows are in wood. In 8 schools the frames are in steel and the shutters are wooden. Children are squatting on floor.

Enrolment pattern in the schools in this district varies from each other. 18% schools have enrolment more than 200 and 35% have the students less than 100. In 30% schools area/student

in classroom is less than 0.73 sqm, which is the minimum as per space standard. 65% schools have adequate light i.e. area of opening is more than 1.5% of area of the classroom. Storage space in classrooms is not provided in 90% schools. Toilet facility is not provided in 85% school. More than 50% schools have North - South orientation.

The maintenance of school buildings is required to maintain and increase the life span.

Visakhapatnam

Visakhapatnam district is located in the north east part of Andhra Pradesh. It is bounded on the north by Vizianagaram district, on the south, by east Godavari district, on the east by the Bay of Bengal and the west by Orissa state. An excellent road, rail and air network connects the city with all-important towns. Red loamy soils predominate with coverage of 69.9% villages. Sandy loam soils come next with coverage of 19.2% villages and the balance is black cotton soils. The district extends an area of 11,161 sqm with a population of 3285092. There are 43 mandals, 3082 villages and the population density is 294 persons per sqm. The number of primary schools in the district is 2767 with overall enrolment of 2,99,907. The literacy rate is 45.57%. Almost 44% of the total geographical areas are covered under forests of eastern ghats (Dandakaranya). 11 of the 42 mandals of the district fall under agency area reserved for local tribal population.
27 school buildings constructed under OB scheme in 10 mandals were surveyed as per the list shown below.

Table 2.4: Number of Schools Surveyed

Name of Mandal	No. of Schools Surveyed
Payakarao pet	4
S.Rayavaram	4
Nakkapalli	2
Rambilli	3
Ravikamatarn	3
Pedabayalu	2
Murchingiputtu	2
Dumbriguda	4
Arakuvalley	2
Ananthagiri	1
Total No. of schools surveyed	**27**

Total No. of OB schools sanctioned for construction in the district -1216

Total No. of OB schools constructed in the district -1199

District educational officer, Visakhapatnam provided necessary help by providing the list of schools in the mandals with mandal map. The teachers of the school buildings cooperated by providing necessary information. 10 schools of 4 mandals of the district are located in the agency area of Danda karanya of Eastern Ghats. The schools are located in the ghats with poor approach roads and there are a number of stream crossings. A few schools could be reached only by foot, which are about l/2 to 1 km distance. The area is thinly populated by tribal people.

General Observations

Majority of the school buildings was constructed by Panchayat Raj Engg. Department and some schools were constructed by A.P.Tribal Welfare Department particularly in tribal areas. Out of 27 schools 23 schools consist of one classroom with a verandah and in 4 schools there is one classroom, verandah and an office room. In 33% of the schools, the walls are in brick masonry, and in 66%, the walls are in RR masonry. In one school fly ash bricks are used for walls. All schools surveyed are constructed with RR masonry in foundation and basement. In 25 schools roof is of flat RCC and in two schools roof is with AC sheets. One OB school building constructed at Gannela in Arakuvalley is in the premises of a residential school and is not used for school purpose. Korrai at Dumbri guda and Jerrala in Murchingiputtu are under construction. Out of the 26 schools surveyed, the window/door frames and shutters in 24 schools are of wood. One school has frame in steel but no shutters. Another school has no window/door frames and shutters. All the schools have cement flooring. In general, the quality of construction is satisfactory, except some minor leakage during rainy season due to the heavy rainfall in the coastal area. The school buildings require occasional maintenance to maintain and extend the life. There are no toilets in the school premises. There is no electricity. Furniture provided is inadequate. The children squat on floor. Mats should be provided for sitting.

Maximum enrolment in schools in this district is 489. 48% schools have students less than 100. Three schools have enrolment more than 250. Area/student in 60% schools is adequate. According to space

standards, minimum 0.73sq.m. area/student is required in squatting system. In 80% schools window area is sufficient i.e. more than 15% of classroom area for proper light and visibility of black board. Built in storage is not provided in classrooms in 90% schools. 50% schools have the desired North - South orientation. Toilets are not provided in 90% schools.

Conclusion of Observations

In Andhra Pradesh OB schools in four districts were surveyed as listed in Table 2.5. The total number of OB schools sanctioned in the district and those got constructed are also given. It can be seen that only 91% of the schools, sanctioned under the OB scheme, have been got constructed in the 4 districts, surveyed in Andhra Pradesh.

Table 2.5: Status of OB Schools

District	Number of Schools Surveyed	Sanctioned	Construct ..d
Cuddapah	26	1257	1060
Karimnagar	24	940	881
Nalgonda	28	1071	990
Vishakhapatanam	27	1261	1199
Total	**105**	**4529**	**4130**

In Cuddapah 73% of OB school buildings are having one classroom with a verandah. In Karimnagar 67% of school buildings are having one classroom with verandah and 33% schools have one classroom with an office room and verandah. In Nalgonda out of 28 schools surveyed 18 schools (64%) are with one classroom, office and verandah whereas 10 schools (36%) are with one classroom and verandah. Out of 27 schools surveyed in Vishakhapatanam, 23 schools (85%) consist of one classroom with verandah and in 4 schools (15%) there are one classroom, verandah and office room. 90% of the schools in Cuddapah are connected with the main roads with good approach roads whereas in Nalgonda the schools are located in interior villages. In Vishskhapatanam, most of the schools are located in ghats with poor approach roads. A few schools could be reached only by foot. In Karimnagar, expect for Malhar Rao mandal, all the schools are approachable with fairly good roads. The teachers are aware of the OB programme. In all the schools, the foundation stones indicate under which scheme and when the school was constructed. The data related to enrolment, classroom spaces, window area, orientation, toilet

facilities, construction materials, construction technologies, access and structural condition of buildings are given in Table-2.6. Squatting system has been adopted for sitting in classes. 0.73 m square area per student is required in this system for sitting. But in 37% schools this standard has not been followed. For proper lighting and ventilation, the window area has to be 15% of the floor area of the classroom, which has been provided in 65 to 85% schools. Locally available materials like granite stones and Cuddapah stones are used in the construction for walling and flooring. The roof is of RCC in almost 100% cases. For door/windows, wood has been used in majority of schools. In Karimnagar, toilets are provided in 90% schools, but in other districts in only 10 to 15% schools, toilets are provided. The schools are fairly in good condition. But there is no system for periodical maintenance. The school buildings require regular maintenance for proper upkeep and to increase their life span.

Table 2.6: Relevant Data for Constructional Aspects

	CUDDAPAH	KARIM NAGAR	NALGONDA	VISHAKHAPATNAM
No. of Schools surveyed	26	24	28	27
Enrolment (max. & min.)	387 & 29	175 &25	263 & 23	489 & 30
Space for classroom (m^2 /student)	< .73 in 40% schools	< 0.73 in 40% schools	< 0.73 in 30% schools	< 0.73 in 40% schools
Window area (% of floor area of classroom)	> 15% in 70% schools	> 15% in 65% schools	> 15% in 65% schools	> 15% in 80% schools
Orientation of building	North - South in 35%schools	North - South in 42% schools	North - South in 50% schools	North - South in 50% schools
Toilet Facilities provided	In 10% schools	In 90% schools	In 15% schools	In 10% schools
Foundation and Plinth	Random Rubble masonry-100%	Coursed rubble masonry -100%	Coursed rubble masonry 100%	Random Rubble masonry - 100%
Walling	Load bearing BK in C.M. - 65% RCC frame + BK - 35%	BK in C.M. - 100%	BK in C.M.- 100%	BK in C.M. - 33% RR masonry in C.M.- 66% Flyash bricks - 1 school
Flooring	Cuddapah stone - 100%	Cuddapah stone - 100%	Cuddapah stone - 100%	Cement Concrete - 100%
Roofing	Flat RCC - 100%	Flat RCC - 100%	Flat RCC - 100%	Flat RCC - 93% AC Sheet - 7%
Joinery (Door/window	Wood - 88% Steel frames &	Wood - 85% Steel frames &	Wood-71% Steel frames &	Wood - 89% Steel frames & wooden

Frames & Shutters)	wooden shutters - 12%	wooden shutters - 15%	wooden shutters - 29%	shutters - 11%
Access	Kutcha	Kutcha	Kutcha	Kutcha
Structural condition/Remarks	Good - 100% No maintenance - 100%	Satisfactory- 100% No maintenance - 100%	Good- 100% No maintenance - 100%	Satisfactory- 100% No maintenance- 100%

Desirable space for squatting $\geq$ 0.73 sq.m/student
Desirable window area $\geq$ 15% of floor area of classroom
Desirable orientation N - S

BK = Brick
CM = Cement Mortar
MM = Mud Mortar
LM = Lime Mortar

PART III

HARYANA

Bhiwani

Detailed technical survey was carried out for the purpose of study of building components constructed under OB scheme in selected government primary schools in district Bhiwani of Haryana. Bhiwani is the southernmost district of Haryana surrounded by several other districts of Haryana namely Hissar, Rohtak, Jhajjar, Riwadi and Mahendragarh and touches Pilani district of Rajsthan on the western border. It is one of the big districts of Haryana and is about 90 to 100 km. across the length and 60 to 70 km across the width.

Bhiwani district has 118 government primary schools; out of which, forty-two Govt. primary schools and Govt. girl's primary schools were surveyed, representing all the seven blocks of this district. Block wise details of the schools surveyed is given in the table below.

Table 3.1: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
Bawani Khera	10	3
Bhiwani	20	9
Badhra	30	9
Dadri II	40	8
Loharu	60	7
Tosham	70	1
Dadri I	930	5
Total No. of schools surveyed		**42**

In general Haryana state, and in particular Bhiwani district has a very good network of pucca roads and practically the roads touch every village of the district. The schools generally are 1/2 km to 12 km away from the main roads. This district mainly has sandy soil and there is scarcity of water. Camels are a prominent mode of transport in the villages, especially in blocks Loharu and Badhra, which are very close to Rajasthan border. The farmers usually adopt sprinkling mode of irrigation for their crops. Every village has tube wells and generally electricity or generators are used for lifting water.

Stones and stone slabs of varying thickness and various sizes are available in plenty from the neighboring state of Rajasthan. They are used extensively in building construction. Stones mainly are used in foundation and stone slabs for roofing. Bricks and cement are also used extensively in the construction of super structure.

General Observations

Out of 42 schools surveyed, 10 schools have more than five rooms, 11 schools have five rooms and the rest have 2 to 3 rooms. 60% to 70% classes are running in old buildings. The construction details for old buildings are generally same. The foundations are in RR masonry in mud mortar. As bricks are available in plenty the walls are with brick in mud mortar or cement mortar with cement plaster on both faces. The roofs of 50% schools are with stone slabs resting on I girders. At 3 sites wooden rafters and purlins are used with wooden planks with mud phuska over that with or without tiles. New constructions under OB scheme have generally foundation in stone/brick in mud mortar or cement mortar. The walls are in brick masonry with cement mortar, with cement plastering on both faces. The roofs of new constructions are in RCC. 60 to 70% schools are in good condition but in general maintenance is quite poor and inadequate. About 20 to 25% schools have problem of leakage through the roofs, crack in walls and separation cracks between old and new constructions. At Budhera, school (1067), the reinforcement of porch slab is exposed and badly corroded. Remedial measures are to be taken to check the corrosion. Bhiwani is in seismic zone IV and buildings should have been provided with earthquake resistant measures like RC bands at plinth, lintel level and vertical steel at corners and junctions of walls. But these measures have not been adopted.

Squatting system is followed for seating in classrooms. According to the space standards for squatting system, minimum 0.73 sqm space per child is required. In Bhiwani 65% schools have adequate space for sitting in classrooms. Due to high enrolment more than 200 in 10 schools, large numbers of students are accommodated in the classrooms. Storage space is not provided in classrooms, which is essential in schools. For proper lighting, window area should be minimum 15% of floor area and this is provided in 80% schools. In 8 schools lighting in classrooms is

inadequate. For schools, the best orientation is North-South for economic sun shading but this is provided in only 10% schools. The toilet facilities are not adequate in 75% of these schools and drinking water is not available in 50% of the schools.

Yamuna Nagar

District Yamuna Nagar of Haryana is situated on the bank of Yamuna river. In three sides it touches the districts of Karnal, Ambala and Kurukshetra and other two sides touch with districts Saharanpur of Uttar Pradesh and Sirmor of Himachal Pradesh. The land is plain and very fertile for agriculture. The source of water is river Yamuna and tube wells. Every village has pucca roads connected with main road. Construction materials like bricks, river sand and crushed aggregate are available. The bricks are of very good quality. The sand is from river Yamuna. The district has a big market of timber. In district Yamunanagar 41 schools were surveyed representing six blocks as given below.

Table 3.2: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
Yamunanagar	10	4
Bilaspur	20	7
Radaur	30	10
Jagadhri	40	7
Sadaura	900	8
Chhachhrauli	-	5
Total No. of schools surveyed		**41**

All the schools are approachable. The schools are about 1/2 km to 2 km away from main roads. The teachers were very helpful and co-operative in conducting the survey. Govt. primary school, Bakala in Sadaura was found open conducting classes even on a holiday. The structural and architectural analysis of each school has been given in the following pages. It is seen that 50% of the schools are in good condition. In other cases the problems related to each school i.e. leakage, dampness, cracks in walls, corrosion of reinforcements are discussed. Repair and remedial measures are to be taken in such cases. There is no regular maintenance. The maintenance will improve not only the appearance of the building but also increase the life expectancy.

General Observations

Total 41 schools were surveyed in Yamuna Nagar district. In 21 schools OB fund has been used for constructing one room and verandah and in 8 schools OB fund has been used to construct 2 rooms and verandah. In such cases mostly the OB block is separated from the Non-OB block or new construction is an addition to old block. Some schools are very old and they were constructed by Panchayat. The foundation and plinth and the walls are in brick as brick is the most common locally available walling material. In the old construction mud mortar is used for masonry but in newer constructions cement mortar is being used for masonry. Three types of roofing systems are adopted, flat RCC, flat RBC and tiles on brick 'kadis' supported on steel I-Girders. 80% buildings are with RCC roof whereas RBC has been adopted in 5% schools, the rest are with tiles on 'kadis' and supported on I-sections. In 40% schools there is no waterproofing treatment above the slab or there is no proper slope to drain off water. In such cases the roof is leaking and walls are damp. Hence waterproofing treatment has to be given on the roof with proper slope and 'gola' injunctions of roof and parapet. In 4 schools out of 41, stagnation of water on the roof has led to corrosion of reinforcement in the slab. The plaster and the cover of concrete started spalling. In such cases the corroded part of the steel has to be removed and additional steel if needed has to be given and a fresh cover concrete to be provided. The ceiling should be then plastered. In 50% of schools, ventilator has become an inlet for water to the classrooms during rains and the walls are always damp. The ventilators should be closed provided with tilting glazed shutters or fixed glasses may he provided. In more than 75% of schools the joineries are wooden. Steel frames are used for about 25% cases. Yamuna Nagar falls in seismic /one IV and earthquake resistant measures are to be given as per the Indian Standard Codes, which have not been followed. Three schools us listed below need immediate attention due to serious distress in the roof.

Enrolment pattern in schools is very different from each other. In 6 schools enrolment is less than 50 and in 14% schools students are more than 200. In 80% schools classes are held in verandah or under the trees in winter and summer season. Classrooms are generally used only during rainy season. As per standard area/student is 0.73 sqm, and in Yamuna Nagar area/student in classroom is adequate, in 70% of schools surveyed. Window area is also

sufficient in 60% schools for proper lighting etc. Toilet facility in more than 80% schools is not adequate and drinking water facility is also to be provided.

Conclusion of Observations

In Haryana OB schools were surveyed in two districts. In Bhiwani district there are 118 primary schools and out of which 42 schools were surveyed representing all the seven blocks of the district. In Yamunanagar 41 schools were surveyed in six blocks.

Table 3.3: Number of schools surveyed

Block	No. of Schools Surveyed
Bhiwani	42
Yamuanagar	41
Total No. of schools surveyed	**83**

Haryana has a very good network of pucca roads and practically the roads touch every village. The schools generally are ½ to 12 km away from the main roads. In Bhiwani, out of the 42 schools surveyed 10 schools (24%) have more than five rooms, 11 schools (26%) have 5 rooms and the rest (50%) have 2-3 rooms. In 65% of the schools, parts of the schools were constructed under OB scheme. In Yamunanagar district, 21 schools (51%) are of one room and verandah and were constructed under OB scheme. In 8 schools (20%) the fund has been used to construct two rooms and verandah. The portion constructed under OB scheme is separated out from the Non-OB block or it is an addition to old block. The other data related to the schools in the district are given in Table 3.4. Squatting system for system for sitting has been followed in all the schools. For squatting, area/student has to be 0.73 m^2. In 67% Schools this has been followed. For proper lighting and ventilation the window area had to be 15% of floor area of classroom, which has been followed in 80% schools. Good quality stone slabs, available in the state, have been extensively used for roofing. In Yamunanagar, tiles with wooden 'kadis' supported on steel girders have been adopted in many schools. It is a prevalent local construction technology for roofing. RCC flat roof is also predominant in the construction. Good quality bricks are available in Haryana and hence the foundation and walls are in brick masonry. The flooring is mainly in cement concrete. In older constructions, wood has been used for doors and windows but with

scarcity of timber and increase in its cost, in recent constructions angle iron sections are used for frames and shutters are wooden. Toilet facilities have been provided in 20 to 25% of the schools. 75% of the schools in Bhiwani and 83% schools in Yamunanagar are in good condition. In rest of the cases there is dampness in walls or leakage from roof or some minor cracks in walls. This should be checked and maintenance should be done. In Yamunanagar 7% schools are in distressed condition, which needs immediate investigations to arrive at remedial measures. Haryana falls under seismic zone-IV and earthquake resistance measures like RC bands plinth and lintel level and vertical steel at corners and junctions of walls should have been provided. But these measures have not been adopted.

Table 3.4: Relevant Data for Constructional Aspects

	BHIWANI	YAMUNA NAGAR
No. of Schools surveyed	42	41
Enrolment (max. & min.)	332 & 44	246 &17
Space for classroom (m^2 /student)	< 0.73 in 35% schools	< 0.73 in 30% schools
Window area (% of floor area of classroom)	> 15% in 80% schools	> 15% in 80% schools
Orientation of building	North - South in 10%schools	North - South in 7% schools
Toilet Facilities provided	In 25% schools	In 20% schools
Foundation and Plinth	BK in CM – 88% BK in MM – 7% Stone in MM – 5%	BK in CM – 43% BK in MM – 17% BK in CM & MM – 36% Stone in CM – 4%
Walling	BK in CM – 90% BK in MM – 10%	BK in CM – 70% BK in MM – 19% BK in CM/MM - 11%
Flooring	Cement concrete - 92% BK paving in Mud - 8%	Cement concrete - 85% BK paving- 9% No flooring - 6%
Roofing	Flat RCC - 43% Stone slab -50% Wooden planks with mud phuska - 7 %	Flat RCC- 80% Flat RBC - 5% Tiles with kadis on I giders - 15%
Joinery (Door/window Frames & Shutters)	Wood - 57% Steel frames & Wooden shutters - 29% Steel- 14%	Wood - 75% Steel - 25%
Access	Kutcha	Kutcha
Structural condition/Remarks	Good - 75% Satisfactory-25% No maintenance - 100%	Serious distress - 7% Satisfactory-10% Good - 83% No maintenance- 100%

PART IV

MADHYA PRADESH

Bastar

The district Bastar was originally bounded with AP in the South, Maharashtra in the West and Orissa in the East and Raipur in the North. In 1998, Bastar district has been divided into three districts, namely Kanker, Bastar and Dantewada. For survey purposes the new district has been considered. There are four tehsils and fourteen block offices. The population is 1116896 as per 1991 census. 70% of the urban population and 17% of the rural population is literate. 32% of male population is literate and 13% of female population is literate. Under Rajeev Gandhi Siksha Mission, 100% access to primary education within 1 Km. of every habitation in Bastar has been ensured. Bastar region comprising of three districts has 3880 revenue villages and 442 tolas and paras with total of 8322 habitations. There were 3918 primary school buildings before the mission, which has grown to 5678. There are 84 primary school buildings and 33 additional rooms under the OB scheme in the old Bastar district.

The district has predominantly tribal population. The soil is mainly red-yellow. Good quality bricks and country tiles are produced here. In majority of the constructions, bricks are used for foundation and walling. In rural area, kachha bricks and stabilized mud blocks are used for foundation and walling. Roofing is mainly of flat RCC and slopping roof with MP tiles in urban areas while thatch roof and country tiles roofing are adopted in rural areas. Out of the 14 blocks, three blocks were surveyed covering 23 schools as follows.

Table 4.1: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
Bakaband	180	10
Bastar	170	9
Bastanar	160	4
Total No. of schools surveyed		**23**

General Observations

From the list of 101 schools in 8 blocks given by NIEPA, total of 23 schools were surveyed. In all the schools, the foundation and plinth are with brick masonry. The walls are 35 cm thick in brick masonry. In 9 schools flooring is with stone patties. In 11 schools the flooring is with cement concrete. In 2 schools mud flooring is given. In 6 schools the roof is sloping with MP tiles supported on wooden framework. In 13 schools roof is sloping with country tiles supported on wooden ballies. Two schools have been provided with flat RCC roof. One school is with thatch roof. Out of 23 schools, one school collapsed. Eight schools require periodical maintenance, like replacement of roofing tiles, repair and painting of wooden supporting structure, repairing of cracks in walls, tainting of frames and shutters of doors/windows. Eleven schools are very old and special structural maintenance is required. Two schools are newly constructed and are in fairly good condition. One is of thatch roof, which is to be replaced. In two schools urinals are provided. There is approach road to three schools while other schools have katcha approach roads.

Maximum enrolment in this district is 197. 20% schools have students more than 150. 45% schools have enrolment less than 100. In 60% schools classrooms are not sufficient to accommodate all the students. Area per student in the class is as low as 0.20 m^2 against the minimum space standard. 0.73 m^2 per student in squatting system. Only 15% classrooms have proper day light for study. In 80% schools storage space is not provided. In 90% schools toilets are required for boys and girls. Only 5% schools have North-South orientation recommended for schools.

Bilaspur

Bilaspur is situated in the eastern part of Madhaya Pradesh. Recently the district has been divided into three districts namely, Bilaspur, Korba and Tanjgir Chapa. However, for the survey work old boundaries of district Bilaspur have been considered. Old district Bilaspur was surrounded with Raygam in East, Ambikapur in North-East, Shahdhoh in North-West, Mandala in West, Raj Nand Gank and Durg in South-West and Raypur in South. Bilaspur has seven

tehsils and ten blocks. The population of the district is about 1694883. 74% of urban population is literate while 38% of rural population is literate. 62% of male population is literate whereas only 28% of female population is literate. The old district Bilaspur has 3590 revenue villages and 2251 tolas and paras making the total of 5841 habitations. The district has attained the goal of providing 100% access to primary education within one km of every habitation of the district. In 1994 there were 4615 primary schools, which increased to 5865 in 1998. There are 82 primary school buildings and 32 additional rooms under OB scheme in district. It is well connected with railways and road.

District is predominantly having red yellow soil. In some part of the district namely Palamgarh, good quality stones are available. Stone and bricks are the main construction materials used for foundation and walling. In urban area, RCC roof is generally adopted, whereas in rural areas MP tile and country roof supported on wooden truss/rafter is generally adopted. From the list of schools provided by NIEPA consisting of 107 schools in the 8 blocks, 21 schools in the 3 blocks of the district have been surveyed.

Table 4.2: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
Lormi	50	12
Pomgarh	240	5
Mungeli	120	4
Total No. of schools surveyed		**21**

General Observations

Out of 107 schools from the list provided by N1EPA, 21 schools have been surveyed, which are distributed in three blocks of the district. Out of 21 schools surveyed, 11 schools are having strip footing foundation in bricks, 6 schools are having coursed nibble stone masonry in foundation. 100% schools are having brick masonry walls in which 90% walls are 35 cm thick. In 12 schools the flooring is of cement concrete, while 8 schools have stone slab flooring, one school is having rammed mud flooring. In 13 schools RCC flat slabs have been provided with RCC supporting beams. 6 schools have roof of country tiles supported on wooden trusses and rafters and two schools have pitched roof with MP tiles. In 14 schools the door/window frames and shutters are

of steel. Only one school is having toilets and in four schools urinals have been provided, but is inadequate. 35% of schools are well connected by pucca roads. 7 schools are in very bad condition having problem of heavy leakage through roof and severe cracks on walls. Flooring of these schools is also worn out. The wooden members are deteriorated. The wooden members are also affected by termites. There is corrosion in steel members. These schools require complete structural maintenance. Five schools are having severe cracks on walls, dampness in walls, which needs maintenance immediately for increasing the life span. At one place, school is running in a forest inspection hut, which is very old and having insufficient space. Here new building is to be constructed. 33% of schools are in fairly good condition and periodical maintenance is required. One school building is found recently constructed and hence is not having any structural problem.

Squatting system has been used for sitting in the school. The maximum enrolment in the school is 321. 48% schools have students between 100-200. In more than 75% schools, area per student in class is less than 0.73 sqm. which is the minimum recommended space in squatting system. 80% schools do not have sufficient daylight in the classrooms. Window area in schools is less than the recommended 15% of floor area. There is no provision of toilet in 90% schools. The best orientation for school i.e. North-South is provided in 35% schools only.

Gwalior

Gwalior district is in the North of M.P. State bounded with Shopur, Morena in the West, Bhind in the North Datiya in the East and Shivpuri in the South. Gwalior has three Tehsils and four block offices. The population of the district is 1293567 as per 1991 census. 71% of urban population and 35% of rural population are literate. 71% of male population is literate whereas 43% of female population only is literate. Gwalior is the main railway junction and is well connected with roads and railways. There is also air connection from Delhi to Gwalior. There are 776 revenue villages and 396 totals and paras having total of 1172 habitations. Under Rajeev Ghandi Sikha Mission, 100% access to primary education within 1 km of every habitation in Gwalior, has been ensured. Before the starting of this scheme there were 1692 primary schools which have now grown to 2049. There are 33 primary OB school buildings and 13 additional

rooms under OB scheme. The district is predominantly covered with red murrum soil. Good quality bricks and red stones are available for foundation and walling. Stone patties are mainly used for flooring and roofing for majority of constructions. Foundation is mainly with coursed rubble stone masonry and walling is mainly with bricks and stones.

Out of the four blocks in the district 22 schools were surveyed covering three blocks.

Table 4.3: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
Morar	20	14
Dabra	30	5
Bhitarwar	40	3
Total No. of schools surveyed		**22**

General Observations

From the list of 93 schools, distributed in five blocks given by NIEPA, a total of 22 schools in three blocks were surveyed. In 21 schools, the foundation is of coursed rubble masonry with locally available red stone. One school is having foundation with bricks. Walling in 15 schools is with brick masonry having a thickness of 35 cm to 40 cm. In the rest of the schools, walling is with red stone having a wall thickness of 40 to 50 cm. In 12 schools, the flooring is with stone patties, in five schools, the flooring is with cement concrete, in one school, mosaic flooring is provided, whereas in four schools, rammed earth mud flooring is provided. In one school flat RCC has been provided for roofing, while in all other schools stone patties supported on steel I-girders and wooden members has been adopted for roofing. In verandah stone patties of full length has been used. Out of 22 schools surveyed, six buildings are very old having inferior and incomplete specifications. These buildings have mud flooring, deteriorated wooden support of roof parties and corroded steel I-sections. The wooden joineries are in very poor condition and affected by termites. There is heavy leakage from roof and heavy dampness in walls. It is not advisable to use these buildings as schools and new buildings should be provided. In the rest of the buildings, five have heavy leakage from roof. There are severe cracks in walls and corrosion in steel girders. These buildings require immediate attention and maintenance should be given to make them structurally and functionally sound. One school building i.e., Bharthari (Code 858)

may collapse at any time. This is abandoned and classes are conducted in Panchayat Bhawan. Eight buildings require periodical maintenance to improve the life span. Two school buildings are recently constructed and hence are not having any structural problems. Angle iron sections are used for door/window frames and steel shutters are provided in the buildings constructed after 1990. In the buildings constructed before 1990 joineries are of wood. In three schools toilets are provided. Five school buildings surveyed are located near main roads whereas seventeen schools are away from main road connected with kaccha roads.

The maximum enrolment in the school in this district is 254. 10% of schools have students less than 100. 20% schools have enrolment more than 200.Classroom area is not sufficient to accommodate all the students. More than 90% schools have area per student much less than 0.73 m^2, which is the minimum as per space standard for squatting system. Only 30% schools have adequate daylight inside classrooms. 70% schools have window opening less than 15% of floor area of classroom recommended for proper visibility in classrooms. Built-in storage space is not provided in 80% schools. Only 10% schools have toilet facility.

Indore

Indore city is one of the leading industrial cities in Madhya Pradesh and is located about 190 km from Bhopal towards South - West. The city is well connected by roads and railways. The Agra - Mumbai National Highway passes through the city. It is connected by air service from Delhi and Mumbai. Indore city is bounded with industrially developed city Dewas in the East, Ujjain, the important pilgrimage place, in North, Dhar in West and Khargone South. It is a historical city developed by Maharaja Holkar and has beautiful touring places like Shishmahal, Gandhi Sagar etc. It is one of the important historical places of 'Nemad' region, generally called as "Marwa' region in the state. Indore district has a population of 18,35,915 as per the census of 1991. 78% of male population is literate while 53% of female population only is literate. The literacy rate in nilation is 76%, while in rural population the literacy is only 44%. The district consists of 4 tehsils and block offices named Indore, Mhow, Sanwer and Deepalpur.

The district has predominantly black cotton soil, which is very good for agricultural purpose. In some parts of the district red stone and white greenish stones are available. Multistoried RCC framed buildings are the common type of construction in Indore. In urban areas people in general adopt brick for foundation and walling. Superstructure is normally with RCC column with plinth beam. Roof is normally RCC. In rural areas, for roofing Manglore Pattern tiles and country tiles are adopted. Bricks are used for walls and foundation of building poses a great problem in black cotton soil as the soil swells with water and shrink when it dries up. In such problematic areas, under reamed pile foundation with single and multibulb, developed by Central Building Research Institute, Roorkee is commonly adopted in both public and private constructions. Generally, bricks in the district are of size 20 x 10 x 10 cm, i.e. the modular bricks popularised by the CBRI. For making good quality bricks from inferior soil CBRI developed 'Ghol Process', which is adopted by more than 100 brick kiln owners.

Indore district has 645 revenue villages and 80 tolas/paras thus making a total habitation of 725. The district has attained the goal of providing 100% access to primary education within one kilometer of every habitation. There were 1445 primary schools in 1994, which has increased to 1565 schools by the end of 1998. There are 26 primary school buildings and 11 additional rooms under Operation Black Board Scheme.

NIEPA had provided a list of 1 16 schools covering all the four blocks of the district. 38 schools in four blocks were surveyed.

Table 4.4: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
Indore	30	15
Sanwer	20	5
Deepalpur	10	13
Mhow	40	5
Total No. of schools surveyed		**38**

Genera1 Observations

Out of the 38 school buildings surveyed in the district, 16 schools have coursed rubble stone masonry for foundation with or without RCC pillars. 11 school buildings have brick masonry

spread footing for foundation. In 9 schools under reamed pile foundation with RCC plinth beam has been used whereas 2 schools are constructed with RCC column footing and plinth beam for foundation.

100% school buildings are constructed in brick masonry generally adopting one and a half brick thick (30-35 cm) walls. However, in case of construction of RCC columns up to roof level i.e. in framed type of construction, the wall thickness commonly adopted is one brick thick wall i.e. 20-23 cm thick..

Out of the 38 schools surveyed, 28 schools have adopted stone slabs for flooring. These stone slabs are locally available, generally of red or white grey colour and commonly of 30 x 30 cm or 40 x 40 cm in size. The remaining 6 schools are having cement concrete flooring, while 4 other schools have mosaic tile for flooring. The roof of 13 school buildings is of flat RCC slab supported on RCC beams in classrooms, while 10 schools have flat roof of stone patties supported on steel I sections. Out of the remaining 15 schools, 14 schools have roof with GI sheet supported mainly on steel trusses while one school has AC sheet roofing.

There is pucca road access available to 17 schools while 21 schools do not have proper road access and are having kuchha road only.

10 schools are provided with toilet/urinal facilities and rest 28 schools do not have any such facility. The toilets facilities available in these schools are inadequate.

Out of 38 buildings surveyed, 16 schools require structural repair. Flooring is completely worn out. Walls have severe cracks, plaster is peeling out, roof has sagged and waterproofing has become completely ineffective, thereby causing ponding of water on roof and causing heavy leakage. The supporting roof members like steel girders and trusses are deteriorated. These buildings require full-scale maintenance involving repair and replacement of major items for making the buildings, useable. Out of these 165 buildings are in such condition that they may have to be abandoned completely as it will be very difficult to make these buildings useable.

Five schools have severe cracks in walls, ineffective waterproofing on roof and settlement of floor. These schools require special maintenance which include replacement/repair of floor,

waterproofing of roof; repair of cracks, replacing worn out floor patches, painting to steel and wooden sections etc.

Nine schools are in fairly good condition and by proper periodical maintenance, they could be brought to use for a long period of time.

8 school buildings are in fairly good condition as majority of these (5 Nos.) are constructed in the recent time (1 -2 years old).

At 2-3 places the building constructed around the year 1990, which were constructed probably under OB had collapsed totally and new buildings have been built here recently. In the proforma they have been reported as new buildings.

Maximum enrolment in this district is 394 in two schools. Squatting system has been used for sitting in the classrooms. 45% schools have students less than 100. Area per student in 75% schools is not adequate to accommodate all the students. The minimum space recommended for squatting system is 0.73 m^2 in class room in primary school. 70% schools have window area less than 15% which is the minimum percentage desired for classrooms. Toilets for girls and boys arc not provided in more than 90% schools. Only 25% schools have good orientation North-South recommended for schools.

Vidisha

District Vidisha is 75 km from the state capital Bhopal. It is in the north of Bhopal and surrounded by districts Bhopal and Raisen in the South, Sagar in the East, Rajgarh in the West and Guna in the North. Vidisha district has seven tehsil headquarters and seven block offices. The population of Vidisha is 970388 as per 1991 census. 70% of urban population is literate while 37.27% of rural population is only literate. 1471 villages have electricity. There are 1624 revenue villages in the district and 223 paras and tolas which makes a total of 1847 habitations. Sanchi is a famous historical place and archeological monument Buddha's 'Stup' is about 8 km from district headquarters Vidisha. Agriculture is the main occupation and it is a wheat cultivating area. Vidisha is well connected with good road and railway from the state capital.

Under Rajiv Gandhi Shiksha mission the district has set up a goal for 100% access to primary education within 1 km of every habitation. There were about 1286 primary schools before starting of the mission and now there are 1806 primary schools. About 520 primary schools were built by the mission under Education Guarantee Scheme. Under operation Black Board Scheme 26 primary school buildings and 10 primary school additional rooms were made available to the district.

The district is predominantly having black cotton soil areas. In some part of the district red stone patties are available which is used for roofing and flooring. The walling material is mainly brick and ted stone. In areas where black cotton soil is predominant, under reamed pile foundation is commonly adopted for buildings. For other areas, foundations are in coursed rubble stone masonry. In the urban construction, roofing is mainly flat RCC while in rural areas the roofing is with flat stone patties supported on steel I-girders. Out of the seven blocks in the district 18 schools in 4 blocks were surveyed.

Table 4.5: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
Vidisha	70	9
Gyaraspur	60	6
Nateran	50	2
Budoda	40	1
Total No. of schools surveyed		**18**

General Observations

From the list of 108 schools distributed in seven blocks given by NIEPA, a total of 18 schools in four blocks were surveyed. Out of 18 schools surveyed, nine schools were having underreamed pile foundation, a technology developed by Central Building Research Institute to be adopted in black cotton soils which is expansive in nature. Eight schools have been provided with coursed rubble stone masonry foundation and one school is having brick masonry for foundation. Good quality bricks are not available in this area. Hence instead of one brick thick wall (approx. 20-23 cm) 1 ½ thick walls i.e. 35 cm thick walls are adopted in load bearing construction in 90% cases. The flooring is with stone slabs in eleven schools and in six schools cement concrete flooring has been given. In one school rammed earth with mud plaster has been provided for flooring. Except one school, which is having Manglore tile roofing, all the schools are provided with stone patties

resting on steel I- gjrders. In verandah stone patties of full length has been used. Primary schools Palki (Code 197), Kramchirusalli (Code 16), Barkhedi (Code 454) are having heavy leakage through roof. There are number of severe cracks in walls. The flooring is totally worn out and these schools are beyond repair. The school at Pipariyanag, (Code 121) is abandoned and presently the school is run in a villager's house. In seven schools there is severe leakage from roof and heavy dampness in walls and the I-girders are corroded. These buildings need immediate attention to improve the structural and functional performance. In the rest of the buildings also, leakage and corrosion have started. If maintenance is not taken up, this will also come under distress condition. One school building at Bilari (Code 458) is recently constructed which is in fairly good condition. Generally it has been observed that the Steel-1-girders are not painted which lead to corrosion. In the construction made in the last decade the door/window frames are with angle iron sections and the shutters are of steel. In the old construction the joineries are of wood. Toilets are not provided in the school campus in 100% cases. In 13 schools arc not easily approachable and having kuchha roads.

Squatting system has been used for sitting in all schools. Two schools have enrolment more than three hundred. 35% schools have enrolment less than one hundred. 90% schools need more space to accommodate all the students properly. Only 20% schools have adequate window area in classrooms. 10% schools have toilet facility in the campus. North-South orientation is provided in 10% schools, which is the best in schools for proper light and economic sun shading.

Conclusion of Observations

Survey of OB schools was conducted in five districts of Madhya Pradesh as listed below:

Table 4.6: Number of schools surveyed

Districts	Number of schools surveyed
Bastar	23
Bilaspur	21
Gwalior	22
Indore	38
Vidisha	18
Total schools surveyed	**122**

84 primary school buildings and one additional room each to 33 existing schools have been constructed under OB scheme in Bastar district, while in Bilaspur there are 82 primary school buildings and additional rooms to 32 existing schools have been built under OB scheme. There are 33 primary schools and additional rooms to 13 schools constructed under OB scheme in Gwalior. In Indore there are 26 primary school buildings and additional rooms to 11 schools have been built under OB scheme. In Vidisha under OB scheme 26 primary school buildings have been constructed and rooms added to 10 schools.

The structural condition of the buildings in this district is very bad. At Bilaspur 37% of the buildings are only in good condition and at Indore only 21% are in good condition. The other buildings require special structural maintenance measures like repair of cracks in walls, replacement of roofing tiles, repair of wooden supporting structure etc. In Bastar, Gwalior and Vidisha more than 90% buildings are in distressed condition. Squatting system has been adopted in the schools. The data related to construction technologies adopted, the construction materials used etc. are given in Table 4.7. In most cases, the window opening provided is less than desired. According to standard, the area/student for squatting should be 0.73 m^2. This has not been followed in 63% cases. As foundation, material, bricks and stones have been used. In Bilaspur and Indore, black cotton soils are prevalent and in such areas the traditional spread footing foundation are not suitable. The soil is having a nature of swelling when it absorbs moisture and cracks while drying up and this leads to development of cracks in foundations and walls. Undrreamed pile foundation, a technology developed by CBRI, is the most appropriate technique for foundations in such case. However, such foundations have been adopted only in 7 to 14 cases in these areas. In almost all districts, brick is the walling material. For flat roofing, RCC has been adopted; while for sloping roof locally available tiles or stone patties are used. Some roofs are with AC/GI sheets also. Wood is used for joinery mainly in Bastar while steel frames and wooden shutters are used in other districts. Toilets are provided only in 10% schools. There is no electricity available in the schools.

Table 4.7: Relevant Data for Constructional Aspects

	BASTAR	BILASPUR	GWALIOR	INDORE	VIDISHA
No. of Schools surveyed	23	21	22	38	18
Enrolment (max. & min.)	211 & 50	321 & 25	280 & 101	394 & 25	318 & 36
Space for classroom (m^2 /student)	< .73 in 60%	< 0.73 in 75%	< 0.73in 90%	< 0.73 in 75%	<0.73 in 10%
Window area (% of floor area of classroom)	> 15% in 15%	>15% in 20%	>15% in 30%	>15% in 30%	>15% in 20%
Orientation of building	N -S in 25%	N-S in 35%	Nil	N - S in 25%	N - S in 10%
Toilet Facilities provided	In 10% schools	In 10% schools	In 10% schools	In 10% schools	In 10% schools
Foundation and Plinth	BK in CM-100%	BK in CM-67% Stone in CM - 19% Pile Foundation - 14%	BK in CM -4% Stone in CM - 96%	BK in CM - 60% Stone in CM - 33% Pile Foundation - 7%	Stone in CM - 50% Pile Foundation- 50%
Walling	BK in CM - 100%	BK in CM - 100%	BK in CM - 68% Stone in CM - 32%	BK in CM - 100%	BK in CM - 100%
Flooring	Cement Concrete - 88% Mud -12%	Cement Concrete - 95% Mud -5%	Cement Concrete -78% Mud -12% Mosaic -4%	Cement Concrete -90% Mosaic -10%	Cement Concrete -94% Mud -6%
Roofing	Flat RCC-12% Country Tiles -88%	Flat RC- 67% Country Tiles - 33%	Flat RCC -4% Stone Patties - 96%	Flat RCC - 4% Stone Patties - 26% AC Sheets -6% GI Sheets - 34%	Stone Patties - 94% Country Tiles - 6%
Joinery (Door/window Frames & Shutters)	Wood -92% Steel (rallies & shutters - 8%	Wood - 38% Wooden frame Steel shutters - 62%	Wood - 63% Steel - 37%	Wood - 34% Steel - 66%	Wood - 62% Steel - 38%
Access	Kutcha	Kutcha	Kutcha/Pucca	Kutcha	Kutcha
Structural condition/Remarks	Good - 8%; Satisfactory - 92% No maintenance -100%	Good - 37% Satisfactory - 63% No maintenance - 100%	Good - 8% Distress -50% Satisfactory - 42% No maintenance - 100%	Good -21% Abandoned Stage -13% Satisfactory - 66% No maintenance - 100%	Good -5% Satisfactory - 95% No maintenance - 100%

PART V
UTTAR PRADESH

Faizabad

Faizabad, a historical city, is situated hi the Eastern U.P. on the bank of river Saryu, about 230 km from Lucknow on Lucknow Gorakhpur highway and Lucknow Varanasi (via Gorakhpur) railway route. District Faizabad shares its boundary with Gonda in North, Azamgarh and Sultanpur in South, Basti in East and Barabanki in West. It is world famous for its Ram Janma Bhumi, Ayodhya, about 6 km away from Faizabad. Ground strata of district Faizabad mainly consists of sandy silt with some percentage of clay ranging from 1.0 m to 1.5 m in depth and followed by poorly graded sand. Its safe bearing capacity at 1.0 m depth is around 6 t/m^2. Ground water is available almost in all places ranging from 3.0 m to 8.0 m depth below ground surface. Good quality burnt bricks; cement, sand and stone aggregate are easily available in the area as construction material. Up to two storey buildings, normally spread footing, foundation is adopted with bricks in cement sand mortar. For superstructure bricks are used in cement sand mortar. The roof is normally with RCC or RBC.

Survey work of Primary Schools of Faizabad District was conducted by a team of Scientists of CBRI. During survey, many times Local District Authorities (associated with primary education) were contacted; they were quite helpful, co-operative in providing proper guidance and help as and when required.

Recently, a new district Ambedkar Nagar is formed comprising a few blocks of district Faizabad. Survey was conducted covering schools of both the districts provided in the list. For better sampling, the remote area schools were also surveyed in both the districts. Schools covered blockwise are as follows:

Table 5.1: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
Masodha	20	4
Pura Bazar	30	4
Milkipur	60	3
Bikapur	80	6
Tarun	90	7
Bhiti	100	6
Akbarpur	120	5
Total No. of schools surveyed		**35**

About 60% schools located at Faizabad district were situated within a distance of 1 km. from village road and easily approachable and rest hi remote area connected with kuchha road 2 to 5 km. Access to these schools was difficult. In district Ambedkar Nagar (earlier Faizabad district) the situation was quite different. There are only about 20% schools located at Bhiti and Akbarpur block, connected with village road and rest are in remote areas connected through kuchha road on which the travel was quite difficult.

During survey it was found that the amount distributed under OB scheme to each school was very limited, out of which even single classroom construction was very difficult. So, the money was utilized for the repair work of the building or relaying the floor or roof or waterproofing of roof. At some places construction of blackboard, purchase of tables, chairs, boxes, almirah, musical and sports kits were done with the money. There were some cases where only bank accounts were opened just for transferring money under OB Scheme, but even after passing about 8-10 years, no money was received.

Data regarding construction of school building under OB or Non OB was recorded based on the information provided by the Head Master or the teacher present on duty during visit and rest of the data is based on the actual measurement or observations. Difficulties were also faced in getting proper data due to transferable posts of teachers and non-availability of previous records with them. In such cases the help of old teachers were sought from the place of their posting in nearby area.

Almost for all school buildings, ftinds were provided by Zila Parisad, Siksha Parishad, Gram Panchayat, Sansad Nidhi or by public contribution of local area.

General Observations

About 80% school buildings consist of 2 rooms and verandah and have Reinforced Brick Concrete (RBC) flat roof with cement and sand mortar rendering over it as waterproofing treatment. Due to shortage of classrooms additional rooms have been constructed with bamboo palmirah thatch roof in about 10% schools. A few old buildings have sloped roofs with clay tiles on wooden supports and are in very bad condition. In one school building, the roof is with precast channel units developed at Central Building Research Institute and its roof is in good

condition. Faizabad is in seismic zone III. As per codal provisions RC band should have been provided at lintel and plinth level, which is not provided. Flooring is IPS or brick paving and is not in very good condition. In 25% cases brick floor has been laid in mud mortar directly over the earth without any top finish. This type of flooring is not suitable for classrooms, as it remains wet throughout the year and insects and ants breed in the flooring. Almost all buildings have dampness in walls due to absence of proper or no DPC, absence of apron or proper drainage in campus. The quality of construction is generally good but the maintenance is poor. There is no regular maintenance fund with them. After construction of building no regular grant is provided for its maintenance by any agency. Only 20% schools were having boys or girls toilet and boundary wall. In the absence of boundary wall, problems of plantation of trees and encroachment by the nearby villagers were reported. Majority of schools has sufficient open ground available with them and future expansion would be no problem.

In three schools, buildings have reached to an alarming condition and may collapse as they are very old and quality of construction is very poor and no maintenance done. They may be demolished and reconstructed. These are presently not being used for taking classes, and classes are being conducted in open ground only.

Since in 80% of the schools, there are only two classrooms, a verandah and one office room, and conducting five classes in the available space is not possible and classes are being arranged in open ground. But during rainy or summer season, arranging classes is a great problem, which require a special attention.

There is shortage of staff in the schools particularly, which are situated in the interior or remote area. There are only one or two teachers posted there. They are also deputed for many other type of duties like Immunization i.e. Polio drop program, preparation of voters list, checking of ration cards, census duties etc. which adversely affect the teaching work.

In some schools, parents are admitting under aged children telling their false age with a view to gain benefit of food grain distribution scheme run by the government. Taking care of such children by the teachers is a great problem. Some schools have only movable black boards in the class, which require more space due to placing it on stand and thereby a less number of students

are accommodated in the classrooms. In 40% schools ventilation is not proper due to small size of windows or sill height more than a metre or obstruction due to adjoining buildings. Ventilation should be improved in such buildings. It has been observed that there is no electricity in schools.

Registration of students in classes I and II is increasing gradually. In 5% cases registration has reached upto 100 which cannot be accommodated in a single classroom of the present size. Area per student in classroom is very low i.e. 0.31 - 0.59 compared to a minimum of 0.73m^2. 75% cases window area is 11% or less than 11% of the floor area which is not sufficient for classrooms.

Hamirpur

Hamirpur district is located in the southern part of Uttar Pradesh. It is approximately 90 km away from Kanpur district. It is a very wide spread district and touches Madhya Pradesh from South, Banda district from East, Fatehpur from North East, Kanpur district from North, Jalaun from North West and Jhansi district from West. In 1995 Hamirpur district has been divided into two districts as Hamirpur and Mahoba. The headquarters of Mahoba district is 80 km away from Hamirpur headquarter towards South. In the northern part of Hamirpur Yamuna river and Betwa river are flowing. Northern part of Hamirpur is very fertile and main occupation is farming.

35 schools have been selected from 101 schools of 10 blocks. Out of 35 schools, 20 schools have been selected from 4 blocks of Hamirpur district and 15 schools from 4 blocks of Mahoba district.

Table 5.2: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
Kurara	10	6
Sumerpur	20	5
Muskara	90	4
Maudaha	100	5
Panwari	60	3
Jaitpur	70	5
Charkhari	80	3
Kabrai	110	4
Total No. of schools surveyed		**35**

Basic Shiksha Adhikari (BSA) of Hamirpur and Mahoba districts have fully co-operated during the survey work. They have provided road maps of different blocks and schools. The teachers were also helpful and co-operative in conducting the survey. Villages were found 1 to 10 km away from main road. Most of the villages were connected with roads. About 25% of villages were connected with kacha roads. Accessibility to some villages was very poor. In fact out of 35, two villages were cut off from district main road. In district Mahoba, village Ganj comes after crossing a check concrete dam and water was flowing over the dam and the survey team had to walk through water. In district Hamirpur, Laraound village comes after crossing the river 'Ceiho' and there was no bridge over the river. Here also team walked through knee high deep water. Schools were surveyed during working time except a few places where local holiday was declared.

All houses were made of locally available materials. In Hamirpur good soil is available for brick making and Yamuna sand is available as fine aggregate. In Mahoba district granite stones are available in plenty. It is used for coarse aggregate, and stone dust is used as fine aggregate. Stones are also used for constructing foundation and plinth.

General Observations

For 50% of schools, the foundation is in RR masonry. About 70% schools have 23 cm thick brick walls in cement mortar or mud mortar. 68% roofs are of flat RCC and the rest are flat RBC and pitched roofs with GI or thatch supported on purlins and rafters. About 14% buildings were found severely damaged as cracks have appeared in floor or walls due to settlement caused by expansive nature of soil. At few places water ponds or canal was found very near to the building. This could also be a reason for the cracks in walls as the soil, there is of expansive nature. Remedial measures to be taken to arrest the widening of cracks and the existing cracks have to be filled up. Buildings, which are not being used for conducting classes because of the distress, could be put to if proper remedial repair measures are taken.

About 20% school buildings were constructed by Rural Engineering Services (RES) in late seventies. Second phase of school building was constructed in 3991 under Zilla Yojana.

Approximately 60% schools are having two classrooms, one office and one verandah. During survey, teachers said that the OB fund was used for purchasing study materials and sports items.

Enrolment pattern in the schools in this district is very different from each other. The strength of students varies from 53-259. Due to high enrolment the area per student in class is as low as 0.22 sqm. The minimum space required for sitting in squatting system is 0.73 sqm. 75% of schools have window area 11% of floor area, which is not sufficient for study purpose. In built storage space is not provided in schools. In 90% schools toilets are not provided for boys and for girls, which is also essential.

Nainital

Nainital is one of the hill districts of Kumaon region of U.P. Himalayas, famous for its rich scenic beauty, landscape, cultural heritage and historical importance. Nainital and its adjoining hills are places of attraction for the tourists. The district encompasses an area of 794 square kilometers and has a population of 1,54,01,74 as per 1991 census. On eastern side it is bounded by Nepal, on southern side by districts of Pilibhit, Berailly and Rampur, on western side by Moradabad, Bijnor and Garhwal while districts Almora and Pithoragarh are situated on its northern side. Administratively the whole district is divided into six tehsils namely Nainital, Haldwani, Kashipur, Kiccha, Sitarganj and Khatima. Recently, some areas of Nainital district have been taken out to form two new districts, i.e. Udham Singh Nagar and Champawat. However, for the "Study of building component of OB Scheme" the old boundaries of the district have been considered.

Nainital district consists of hilly area as well as plain area and for study, the schools have been selected in such a way that they represent typical examples of the existing scenario of buildings in the two areas. For survey, 29 schools were randomly selected from different development blocks, namely, Kashipur, Haldwani, Sitarganj, Khatima, Bhimtal, Betal Ghat, Kotabagh and Ramgarh and detailed study of the schools was conducted.

Table 5.3: Number of Schools surveyed

Block	Block Code	No. of Schools Surveyed
Betal Ghat	80	3
Bhimtal	70	4
Haldwani	110	5
Kashipur	30	5
Khatima	150	3
Kotabagh	50	3
Ramgarh	60	3
Sitarganj	140	3
Total No. of schools surveyed		**29**

Most of schools in hilly area were not accessible by pacca road. The study revealed that generally 2-3 classrooms and a verandah are provided in a school to accommodate five classes. Since, the schools are having 2-3 teachers out of them one is mostly engaged in office work, only one or two teachers take care of all the classes. In case of single teacher schools, the school remains closed when the teacher has to attend meetings etc. or is on leave. Teachers are also involved in elections, awareness campaigns about polio and such other activities, which disturbs the teaching work.

In most cases the teachers come from nearby town and after school hours the building remains unattended. In the absence of boundary wall or caretaker, it is difficult to maintain the school building and nursery. There was a felt need for boundary walls and for an attendant for proper maintenance of the building after school hours.

General Observations

In most of the cases the school building is of Non OB. In some cases one classroom or whole school is built with World Bank aid adopting a type design. Villagers have donated land or they have participated in the construction activity. OB fund has been used for constructing toilets and for purchasing of almirahs or teaching aids. For foundation, plinth and walls, bricks have been used in 76% of the schools surveyed. In old construction stone has been used in mud/lime/cement mortar which is 35%. The joineries are in wood. In hilly areas 31% of the surveyed schools are having sloping roof. 27% of the schools surveyed are having RBC and 65%

RCC roofs. For sloping roof, GI sheets on timber structural support have been used with wooden ceiling. Water logging around the building is reported in many cases due to construction of schools hi low-lying areas and improper drainage. This has led to settlement of floor and cracks in walls. Proper drainage should be given in such cases. Action should be taken to repair the cracks in walls or slabs. In all the schools cement flooring has been provided. The area falls under seismic zone IV and earthquake resistant measures should have been taken in the construction like provision of RCC or wooden band at lintel, roof and plinth level and vertical reinforcement at corners and junctions of walls. In 3 schools lintel band has been provided. More than 90% buildings are in good condition. In two cases new buildings are being constructed.

In this district the enrolment in most of the schools is very high. Squatting system is used in classrooms. Due to high enrolment area/student in classes is very less as compared to desired space standard of 0.73 sqm per child. Window area in most of the school is adequate, for proper lighting. Audibility and visibility in classrooms is proper. The best orientation for schools is North-South for economic sun shading, which is provided in 14% schools. In 34% schools, NW-SE and in 31% NE-SW orientation is provided due to climatic factors and topography. In 85% schools provision of toilet has been made. There is growing awareness about education especially among girls in hilly regions. There is no electricity in the schools. The attendance was good and the students are well mannered.

Tehri Garhwal

The district of Tehri-Garhwal is located in the hills of UP about 300 km from Delhi. This is a mountainous terrain with an altitude of 618 m from MSL at Devaprayag, 1676 m at Chamba and approximately 2000 m at Thatur in Jaunpur block. The district is known for its high peaks of Nag Tibba (3048 m above MSL) and Chandra Badni (2756 m above MSL). There is a famous temple at Chandra Badni. The Tehri town is at the 'Sangam' of river Bhagirathi and Bhilangana. The district has a few geological faults and region experiences frequent landslides. This region is of slate and phyllites stone and the same is used extensively in building construction. The roads and pathways, if at all existing, are undulating and having steep slopes. After every rain,

landslides occur, blocking many of the roads and pathways. Transportation and communication becomes very difficult in this region.

The villages in the region are sparse and are located a few kilometers away from each other. The village settlements are generally approachable by narrow pathways either higher or lower than the road level. Primary schools, which are set up in villages, are usually located on the boundaries of the villages. But these locations facilitate easy movement of students to the school as they normally come from more than one village. These locations are not convenient to the teachers. The teachers in most of the schools reside in bigger villages or small towns away from the school. Hence, they have to travel by some vehicle for a few kilometers and then trek upwards or downwards to the school. The teachers find it inconvenient to stay in the villages due to lack of suitable accommodation and other basic facilities. Some times, a single teacher runs the school and in case, the teacher has to take leaves, holiday has to be declared. When there is more than one teacher and the school is at far off remote areas, many a times they come to school in turn.

The school building usually consists of 2 or 3 rooms and a verandah. One room is normally used as an office and the rest as classrooms. The teaching activity is either carried out in the verandah or in the open. The classrooms are some times used for other purposes like cooking, storage of wood or other materials. According to some teachers the classrooms are used as stores as per the directions of the Village Pradhan. In district Tehri Garhwal 19 schools have been surveyed in six blocks as shown in Table 5.4.

Table 5.4: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
Bhilangana	20	1
Jakhanidhar	30	5
Jaunpur	40	2
Chamba	60	4
Narendra Nagar	70	4
Devaprayag	80	4
Total No. of schools surveyed		**19**

General Observations

From the list of 102 schools distributed in 10 blocks supplied by NIEPA, a total number of 19 schools in 6 blocks of Tehri Garhwal were surveyed. In 95% of the schools the foundation and the plinth have been constructed with locally available stones i.e. slates or phyllites. 70% of the schools surveyed have walls of approximately 50 cm thickness using stone masonry in cement mortar while 25% of the schools have walls in brickwork. 5% of the schools use stone masonry and brick masonry both as walling in different parts of the same school. 58% schools are having flat RCC roofs while sloping roof with GI sheet is provided in 37% of schools. 5% of the schools are having both RCC and slopping GI roof in different rooms of the same school. Out of the flat RCC roofs it is observed that 55% of them are without proper cover to the reinforcement, giving rise to early corrosion in the reinforcing bars. In such cases, if immediate measures are not taken to arrest corrosion in reinforcement by protective coating and by giving cover to concrete, the slab may collapse. More than 50% of schools are having structural cracks in the walls ranging from 1-2 mm wide to 5-6 mm wide, which might have appeared due to earthquake. Though Garhwal is in Seismic Zone IV no earthquake resistant-measures, as per the codal provisions, have been provided in the buildings. It is advisable to repair the cracks and introduce earthquake resistant measures wherever feasible. The buildings call for regular maintenance.

In this region, in all schools squatting pattern is used for sitting. In 80% of schools due to less number of students in classes, the area per student is much more than the minimum space standard, i.e. 0.73 sqm/student. Perhaps due to climatic reasons the window area given is less than 15% in more than 75% buildings, which is not advisable for schools. Visibility of black board in classrooms is not adequate. 20% schools have the North-South orientation, which is best for schools, and the rest have NE-SW/E-W orientation. Built in storage space is not provided in any school. Toilet, which is essential for the children, is not provided in any school. In 90% of the schools there is no drinking water facility within the school boundary.

Conclusion of Observations

Survey of OB schools was conducted in four districts of Uttar Pradesh as listed in Table 5.5.

Table 5.5: Number of Schools Surveyed

Districts	Number of schools surveyed
Faizabad	35
Hamirpur	35
Nainital	29
Tehri Garwal	19
Total schools surveyed	**118**

About 60% schools in Faizabad are situated within a distance of 1 km from main road and are easily approachable and the rest are in remote areas. In Hamirpur, accessibility to some villages was poor as they are 1 to 10 km away from district main road. In district Nanital, schools have been located in such a way that some of them are in hilly areas and others in plains. Most of the schools in hilly area not accessible by road and the survey team had to trek. In Tehri Garhwal, the schools are in remote villages. To reach the schools one had to trek upwards or downwards a few kilometers from the road. The locations facilitate easy movement of students but are not convenient to teachers who do not stay in the village. They find it inconvenient to stay in the village due to lack of suitable accommodation. Single teacher mostly runs school. When there are more than one teacher, many a times, they come in turn. There is shortage of staff and also they are deputed to other type of duties like immunization, polio drop programme, preparation of voters list etc. 80% of the schools are with two classrooms, an office/principal's room and verandah. Conducting five classes in the available space is not possible and classes are arranged in the open. But during rainy or summer season arranging classes is difficult. Clear information on whether the building distributed under OB scheme or not was not available. In many cases the amount distributed under OB scheme or not was not available. In many cases the amount distributed under OB scheme was very low even for the construction of single classroom. So the money was utilized for the repair work of the building or relaying the floor or roof or water proofing or purchasing of study materials or sports goods. Squatting system is used for sitting. Nainital and Garhwal are in seismic zone-IV. No earthquake resistant measures, as per codal provisions, have been provided in the buildings. In Tehri more than 50% buildings are having structural cracks, which might have appeared due to past earthquakes. It is advisable to repair the cracks and introduce resistant measure wherever feasible. The details regarding materials used in construction, construction technology adopted etc. are given in Table 5.6. The minimum

area/student for classroom has not been met with in 54% schools. In Nainital the minimum window area is not provided in 90% schools and in other districts, the requirement has not been fulfilled in 75 % cases. Bricks and stones are the prevalent materials for construction for foundation, plinth and walling. In Hamirpur in problematic soil, pile foundation has also been used. Roofing is mainly flat with RCC and RBC. For sloping roof, country tiles, GI sheets or thatch have been as opted. A good percentage of schools have brick paving as flooring while cement concrete is the predominant flooring material in other schools. There is no proper system of maintenance. Because of this, many buildings are in deteriorated condition. In Hamirpur 14% buildings and in Tehri 55% buildings are severely damaged. It has been observed that there is no electricity in schools.

Table 5.6: Relevant Data for Constructional Aspects

	FAIZABAD	HAMIRPUR	NAINITAL	TEHRI GARHWAL
No. of Schools surveyed	35	35	29	19
Enrolment (max. & min.)	463 & 96	528 & 29	372 & 22	144 & 14
Space for classroom (m^2 /student)	< 0.73 in 80%schools	< 0.73 in 80%schools	< 0.73 in 35%schools	< 0.73 in 20%schools
Window area (% of floor area of classroom)	> 15% in 25%schools	> 15% in 25%schools	> 15% in 10%schools	> 15% in 0%schools
Orientation of building	N - S in 37% schools	N - S in 14% schools	N - S in 14% schools	N - S in 20% schools
Toilet Facilities provided	In 20% Schools	In 10% Schools	In 85% Schools	No toilet
Foundation and Plinth	BK in CM - 66% BK in MM - 23% BK in LM- 11%	BK in CM-50% R.R.masonry - 15% Pile foundation - 35%	BK in CM - 76% Stone in LM/CM/MM - 24%	Stone in CM - 90%
Walling	BK in CM - 71% BK in MM -26% BK in LM - 3%	BK in CM - 68% BK in MM- 17% BK inLM-15%	BK in CM - 76% Stone in CM - 24%	BK in CM - 30% Stone in CM - 70%
Flooring	Cement concrete - 99% BK paving - 69% No flooring - 2%	Cement concrete - 83% BK paving-17%	Cement concrete - 100%	Cement concrete - 85% BK paving/mud mortar -15%

Roofing	RBC - 80% Country tiles/AC sheets/thatch - 20%	FlatRCC-68% Flat RBC/GI sheets 32%	Flat RCC - 65% Flat RBC - 27% GI sheets - 8%	Flat RCC - 58% GI Sheets - 42%
Joinery (Door/window Frames & Shutters)	Wood - 43% Steel frames & wooden shutters - 57%	Wood - 26% Steel frames & wooden shutters - 52% Steel - 22%	Wood-100%	Wood - 58% Steel frames & wooden Shutters - 42%
Access	Katcha	Katcha	Katcha	Katcha
Structural condition/Remarks	Alarming state - 35% Abandoned - 8% No maintenance-100%	Serious distress - 14% No maintenance-100%	Good - 90% No EQ resistant measures - 100% No maintenance - 100%	Distress - 55% No EQ resistant measures - 100% No maintenance - 100%

PART VI

WEST BENGAL

Barddhaman

Bardhaman is a district of West Bengal located in the South central part of the State, which is locally termed as Rarh Bhumi. The district lies between 22°56' - 25°55' North latitude and between 86°48 ' - 88°25 ' East longitude in the gangetic plain with four major rivers namely Bhagirathi, Damodar, Ajay and Baraekar flowing through it. The land on the eastern part of the district has been formed by silts of Bhagirathi river. This area is plain and very fertile. The land on the western part of the district is a part of Chota Nagpur plateau of Bihar and the soil here is rocky and formed of red soil mixed with stone chips. This area is rich in minerals and coal. The climate of the district is tropical monsoon type. The maximum and minimum temperature generally varies between 42.7°C to 8.8°C. The relative humidity generally varies from 35% to 85%. The district experiences an average annual rainfall of 1400 mm. The district ranks third in the State with an area of 7024 sq.km and population of above 6 million (1991 census). The population density of the district is 861 persons per sq.km. and sex ratio of 899 females per 1000 males (1991 census). The district has 61 towns and 2488 villages inhabited. This is one of the most developed districts of the State.

The traditional construction materials are mud, thatch, clay tiles, burnt bricks etc. Two storeyed mud walls are quite common in some parts of the district. Walls of structures in villages are generally in mud or burnt brick. Roof usually in AC/CGI sheet and thatch. However, RCC roofing is quite common these days. Stone chips are not available locally and are usually brought from outside.

The main potable water sources of the villages are hand pumps and tube-wells. The schools were found to use mainly the community source of water or their own hand pumps. Latrines were found in quite a few schools however they were inadequate.

Thirty schools in the district were surveyed. Block wise distribution of number of schools surveyed is given in Table 6.1.

Table 6.1: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
Barddhaman	340	8
Memari I	50	10
Memari II	60	5
Galsi II	110	7
Total No. of schools surveyed		**30**

General Observations

Out of the 30 schools surveyed in the district about 40% of the schools are constructed under OB scheme. In 10% schools the fund was used to construct one room or for repair and maintenance of the existing building. Brick is the most common walling material available for pucca building. The foundation and plinth of 19 schools are with bricks in cement mortar while the rest are with bricks in mud mortar. The walls in 19 schools are with brick in cement mortar while the rest are with brick in mud mortar. In 22 schools the flooring is of cement concrete, in four schools the flooring is partially IPS and partially brick paving or mud floor, in two schools the flooring is of brick paving. Two schools have completely mud flooring. The roofing in 16 schools is of flat RCC. Eight schools are partially in RCC roof and partially with GI sheet or AC sheets. Five schools are having slopping roof with GI sheets or AC sheets. In the rest of the schools the roof is of thatch, country tiles or of reinforced brick. The joineries in 23 schools are of wood, in 4 schools the frames are of steel and shutters are in wood. In two schools both shutters and frames are in steel, in one school there is no door/window frame or shutters, in 13 schools toilets are provided but not adequate. The approach road to only one school is pucca. 7 schools are in good condition. In 6 schools there are minor cracks in walls, in one school there is settlement of foundation. The other schools are just satisfactory or are in very poor condition with cracks in walls, settlement cracks in floors, or heavy leakage from roof. There is no regular set up for maintenance of the building. Periodical maintenance will improve the structural condition and appearance of the building and also will increase the life span. The structural condition of school at Mahesdanga (Code 3362) is alarming which needs immediate attention. In two school sites the soil is black cotton soil. With traditional spread footing foundation in this soil diagonal cracks have appeared on the walls.

Squatting system has been used in this region for sitting in the school. Here 30% school shave students more than 200. Maximum enrolment is 515 in one school and in this school even girls' enrolment is more than boys. Here 80% schools have the North-South orientation, which is the best orientation and recommended for schools for proper light and economic sun shading. 40% schools have toilet facility and out of this 50% schools have inadequate toilet facilities. In 90% schools area per student in class is less than that recommended i.e. 0.73 sqm./student due to high enrolment 80% schools have window area sufficient for proper light etc.

Jalpaiguri

Jalpaiuri is a district of West Bengal located in the Duars, Terai foothills of the Himalayas in the north. The district lies between 26°16' - 27°00' North latitude and between 88°04' - 89°53' East ngitude. The area is plain varying in altitude from 75 m to 300 m. The soil is formed of coarse pebbles in the north and fine sandy clay in the south. Principle Rivers of the district are Tista, Torsha, Jaldhaka and Raidak. The district has numerous water tanks and ponds. The climate is hot and humid, and the district experiences heavy monsoon. The maximum and minimum temperature generally varies between 36.3°C to 7.2°C. The relative humidity generally varies from 8.8% to 43%. The district experiences an average annual rainfall of 3353 mm. The district covers an area of 6237.6 sq. km. and has a population of above 2.8 million (1991 census). The population density of the district is 450 persons per sq. km. and sex ratio of 927 females per 1000 males. The district has 15 towns and 734 villages inhabited (1991 census). The district has a forest cover of 1824 sq. km. (1991 census) forming about 30% of the total area.

The main traditional construction materials in the district are timber, bamboo, CGI sheets, burnt bricks, river boulders etc. The traditional construction of wall is with timber framework with timber plank or bamboo mat paneling. Roofing is usually slopping with CGI sheet because of heavy rainfall. Half brick thick burnt brickwork spaced at intervals with pillars are becoming quite common. RCC for roofing is still not predominant. The main potable water source of the villages is wells and tube wells. The schools were generally found to use community source of water. Quite a few schools have scarcity of drinking water with no potable source of water in the neighbourhood. Most of the schools do not have latrines.

Twenty-five schools in the district were surveyed Block wise distributions of numbers of schools are given in Table 6.2.

Table 6.2: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
Jalpaiguri	10	5
Maynaguri	20	8
Rajganj	40	6
Matiali	50	2
Aipurduar I	120	4
Total No. of schools surveyed		**30**

General Observations

In this district 25 schools were surveyed. In 21 schools the foundation and plinth are with brick in cement mortar. The rest are either in mud or with timber ballies and posts. The walls are of brick in cement mortar in 21 cases. In other cases the walls are with timber ballies, bamboo mats or even with GI sheets supported on timber ballies. In 20 cases the flooring is cement concrete. In other cases the flooring is of mud. In one school the roof is of flat RCC. The rest are sloping with GI or AC sheet supported on timber supporting structure. In all cases the joineries are of timber except one school where there are no door/window frames and shutters. In five schools toilets have been provided. The approach roads to 9 schools are pucca and the rest are kachha. Only five schools are in good condition. Since most of the structures are kachha very frequent repairs are needed for which funds are not available. Hence the buildings are deteriorating.

The maximum enrolment in this district is 422. Only 28% schools have enrolment less than 100. 32% schools have enrolment more than 200. A maximum girl student in one school is 199. In 90% schools, classroom area is not sufficient for sitting due to high enrolment. The minimum space required in squatting system is 0.73 sq. m. per child. Window area should be 15% of floor area of classroom for adequate light. Only 35% classrooms have proper lighting inside for study. Storage space is not provided in class in more than 80% schools. 50% schools have North-South orientation, which is the best for schools. 95% schools are not having any toilet facility.

Maldah

Maldah is a district of West Bengal located in the northern plains in the north of river Ganga. The district lies between 25°30'08" - 24°48'20" North latitude and between 88°28' - 87°45'50"

East longitude. The district is divided by river Mohananda and forms a delta with river Ganga. The area is a typical alluvial Gangetic plain. The area is low-lying and extremely prone to floods. A major part of the district faces floods frequently. The climate of the district is tropical monsoon type. The maximum and minimum temperature generally varies between 42.1°C to 6.7°C. The relative humidity generally varies between 84 to 35. The district experiences an average annual rainfall of 1400 mm. The district covers an area of 3733 km and has a population of above 2.6 million (1991 census). The population density of the district is 706 persons per sq.km. and sex ratio of 899 females per 1000 males (1991 census). The district has 4 towns and 1641 villages inhabited.

The traditional construction materials are mud, burnt bricks, clay tiles, CGI sheets etc. Mud walls are quite common in villages and many schools were found having mud walls. Burnt brick in mud mortar is also a common form of construction in the area. Roofing is either in clay tiles or CGI sheets or in some cases thatch. RCC roof is not common in this district.

The main potable water source of the villages is wells, hand pumps and tube wells. The schools were generally found to use community source of water, or their own hand pumps. Some schools have scarcity of drinking water with no potable water source in the neighborhood. Latrines were found in a very few schools and were inadequate.

Thirty-eight schools in the district were surveyed. Block wise distribution of number of schools is given in Table 6.3.

Table 6.3: Number of Schools Surveyed

Block	Block Code	No. of Schools Surveyed
English Bazar	120	12
Harischandrapur II	40	4
Chanchal I	50	5
Kaliachak I	130	5
Kaliachak II	140	7
Ratual	10	2
Bamangola	100	2
Manikchak	70	1
Total No. of schools surveyed		**38**

General Observations

In this district 38 schools were surveyed. In 18 schools the foundation and plinth are with brick in cement mortar. In ten schools the foundation and plinth are with brick in mud mortar. In five schools foundation and plinth are partially with bricks in cement mortar and bricks in mud mortar. Three schools are having foundation in mud and two buildings are in collapse state. The walls are with brickwork in cement mortar in 15 schools. 5 schools are having walls with brick partially in cement mortar and partially in mud mortar. In 11 schools the walls are with brick in mud mortar. In two buildings the walls are with bamboo mat. Two buildings are in collapse state and in the rest of the schools the walls are of mud. The flooring in 16 schools is of cement concrete. In the rest of the schools, mud flooring or, brick paving or no flooring is provided. In 10 schools the roofing is flat RCC. In 15 schools the roofing is with country tiles supported on bamboo or timber supporting structure. Two schools are in collapse state. One school is having polythene sheet roofing and the rest are with AC/GI sheet over timber or bamboo supporting structure. In 31 schools the joineries are of wood. In three schools there are no doors/windows. In one school wooden frames and aluminum shutters are provided. In the rest of the schools the door shutters are of bamboo. Toilets are provided in 5 school campus. Pucca approach road is available in 5 schools. Only four schools are in reasonably good condition. The other schools are below satisfactory level or in very poor condition having very poor specification and deteriorated during these years. There is no maintenance.

Maximum enrolment is 463. 70% schools have more than 100 students. 30% schools have more than 200 students. The minimum recommended space in squatting system is 0.73 sqm per student in primary schools and only 20% schools have sufficient space in classrooms. 35% schools have window area more than 15% of floor area for proper lighting. Brick jali has been provided along with windows in some schools. 14% schools have the north-south orientation recommended for schools.

Conclusion of Observations

In West Bengal OB scheme schools were surveyed in three districts as mentioned in Table 6.4.

Table 6.4: Number of Schools Surveyed

Districts	Number of schools surveyed
Barddhaman	30
Jalpaiguri	25
Maldah	38
Total schools surveyed	**93**

Out of the 30 schools surveyed in Barddhaman about 40% are constructed under OB scheme. In 10% schools the fund was used to construct one room or for repair and maintenance of the existing building. In the other two districts this data is not known. The details regarding construction materials, technologies used in construction etc. are given in Table 6.5. The main construction materials for foundation and walling are bricks. Roofing is of flat RCC or sloping with GI of AC sheet supported on timber/bamboo supporting structure. In Maldah roofing of country tiles supported on bamboo or timber supporting structure is also seen. Timber has been mainly used for doors and windows. 50% of the schools in this district have structural problems. Squatting system for sitting has been followed in all schools. 84% in West Bengal do not satisfy the minimum space requirement for classrooms. 50% schools have been provided with a minimum window area of 15% of the floor area to provide the required natural lighting. 59% of the schools have N-S orientation, which is the most desirable for school buildings. In 69% of schools toilets are not provided. Jalpaiguri and Maldah are in seismic zone-IV; but no earthquake resistant measures have been provided.

Table 6.5: Relevant Data for Constructional Aspects

	BARDDHAMAN	JALPAIGURI	MALDAH
No. of Schools surveyed	30	25	38
Enrolment (max. & min.)	515 &46	422 & 50	463 & 29
Space for classroom (m2 /student)	< 0.73 in 90%schools	< 0.73 in 84%	< 0.73 in 80%
Window area (% of floor area of classroom)	>15% in 80%	> 15% in 35%	>15% in 35%
Orientation of building	N-S in 80%	N-S in 50%	N-S in 49%
Toilet Facilities provided	In 50% Schools	In 20% Schools	In 23% Schools
Foundation and Plinth	BK in CM - 74% BK in MM - 20% BK in MM & CM - 6%	BK in CM - 88% BK in CM & Timber post - 4% Sal Balah -8%	BK in CM -51% BK in MM -34% BK in CM &MM-13% Rammed Earth -2%

Walling	BK in CM - 64% BK in MM - 30% BK in CM & MM - 6%	BK in CM -84% BK in CM & GI Sheet-8% Timber Planks -8%	BK in CM -51% BK in MM -30% BkinCM&MM-13% Jafri & Sulti Bamboo -6%
Flooring	Cement concrete - 75% BK paving in mud - 15% BK Paving in Concrete -10%	Cement concrete - 84% Cement concrete - 4% Timber -4% Katcha -8%	Cement concrete - 52% Cement concrete - 10% BK Paving -10% Mud -28%
Roofing	Flat RCC -57% GI Sheet -20 Flat RCC & GI Sheet -23%	Flat RCC - 4% AC Sheets -16% GI Sheet over timber support -80%	Flat RCC -28% GI Sheets -13% GI Sheet &Tiles-21% Ranigange Tiles - 38%
Joinery (Door/window Frames & Shutters)	Wood -81% Steel frames & shutter -6% Steel frame & wooden Shutter -13%	Wood -100%	Wood -100%
Access	Katcha	Katcha	Katcha
Structural condition/Remarks	Structural problem - 50% Good - 50% No maintenance - 100%	Structural problem - 50% Good - 50% No maintenance - 100%	Structural problem - 50% Good - 50% No maintenance - 100%

PART VII

RECOMMENDATIONS

1. Provision of at least two reasonably large rooms that are usable in all weather with a deep verandah is an essential requirement for schools under OB scheme. In schools, which have only single room, at least one more room should be added.

2. 37% schools in Andhra Pradesh 33% schools in Haryana, 62% schools in M.P., 54% schools in U.P. and 84% schools in West Bengal were not satisfying the minimum space requirement for classrooms. Hence, additional classrooms should be constructed in these schools.

3. Separate toilets for girls and boys are most essential in all schools. Where they are not existing, immediate action must be taken to construct toilets.

4. In schools where there is no provision for drinking water, funds may be provided under OB or other schemes to put up a hand pump or other facilities for supply of drinking water. Where existing pumps are not working, they should be got repaired.

5. Efforts should be made to provide electric connection to the schools, so that teaching could be done under artificial light, during bad weather conditions also.

6. Periodic maintenance of buildings is essential for proper upkeep, appearance, functional utility and to prolong the life of the buildings. The state governments should arrange for regular maintenance of the buildings through their Rural Engineering Department or PWD or any other Engineering Department or through the Panchayats.

7. The survey has pinpointed the school buildings which are having distress in the form of leakage from roof, dampness in wall, rising dampness from ground, crack in walls/roof, corrosion of reinforcement and spalling of concrete from slabs, beam etc. Detailed investigations of these buildings should be got carried out by specialized organizations to suggest remedial measures. The buildings, which have been found structurally unsafe during the survey, should be got vacated immediately.

8. Earthquake resistant measures, as specified in the Indian Standards, have not been provided in the school buildings, located in high seismic zones. The concerned state governments may be asked to seek the advice of specialized organizations on seismic retrofitting measures to be taken for such buildings.

9. In future constructions, adequate attention should be paid to selection of site, so that low lying areas are avoided and easy access is available to the school. Orientation of building and other aspects should also be given due attention.

10. A large number of schools did not have sufficient storage space. There is a need to create built-in storages in these schools or to provide almirah, boxes etc.

11. Squatting on bare floor is not advisable, especially during extreme climates. 'Dhurries' should be provided in the classroom. There should also be plans to provide furniture to the children in due course of time. However, this will call for additional space requirements in the schools.

12. In many of the schools, there is no furniture, even for the teachers. Necessary action should be taken to fulfill the minimum requirement of furniture to the teachers.

13. Some of the schools were not having flag posts. Each school should have a flag post.

14. To attract the children to the school and to inculcate in them a desire to keep their environment neat, clean and beautiful, the schools should be encouraged to improve their environment. Local agriculture/horticulture officers/BDO's/forest officers be asked to chalk out plans to plant shady trees and to have flower/vegetable gardens /lawns in the school premises. Funds should be provided to the school by agricultural/forest Department/BDO's for planting trees and setting up gardens, which should be maintained by the teacher and students on self help basis.

15. Hedges/fences should be made around the boundaries of the school compound.

16. Teaching is not done in single teacher schools, when the teacher is on leave or away from school on other duties. Education Department should provide substitute teachers when the regular teachers have to go on other duties or proceed on leave.

17. Study on building components of OB scheme has so far has been carried out only in 5 selected states. It is advisable to carry out such studies in other states also.

PROFORMA FOR COLLECTING DATA

1. IDENTIFICATION DATA (SCHOOL WISE)

		CODE
1.1. State	:	---------
1.2. District	:	---------
1.3. Block	:	---------
1.4. Village	:	---------
1.5. School	:	---------
1.6. Address of School	:	

Pin Code ---------- Phone (if any) ----------

1.7. Attach the photograph of the front view of the school building with the code no. of school noted at the back side.

STRUCTURAL AND CONSTRUCTIONAL ASPECTS

Materials/ Specifications/ Techniques of Construction

Foundation & Plinth : Material Used----------

DPC : Material Used----------Thickness----------cm

Walls : Material Used----------Thickness----------cm

Floor Finish : IPS/Mosaic/Brick Paving/Any Other ----------

Columns : Material Used----------Size ----------cm

Roof :

Pitched - MP Tiles ----------

Slates ----------

GS/AC Sheets ---------

Any Other ----------

Flat – RCC ----------

RBC ----------

Any Other ----------

Door/ Window/ Ventilator

Frame : Material Used----------

Shutters : Material Used----------

Rendering on Walls : External ----------

Internal ----------

Plaster on Ceiling : Yes/No. If yes, Material Used ----------

Finish on Door/Windows :

Terracing : Lime Concrete with Tiles ----------

Mud Phuska with tiles ----------

Any Other ----------

Any Other Information :

General Quality of Construction : Good/Satisfactory/Poor

List down specific deficiencies

II. FUNCTIONAL PERFORMANCE

Leakage from Roof : Yes/No

Extent : Great/Some/Limited

Leakage at junction of Roof & Wall : Yes/No

If yes, Specify : ----------

Dampness in Wall : Yes/No

Extent : Great/Some/Limited

If yes, specify location : ----------

And reasons thereof : ----------

Settlement cracks in Floor : Yes/No

Extent : Great/Some/Limited

If yes, specify location : ----------

And reasons thereof : ----------

Water logging : Yes/No

Max. Level of Water Around Building During Rains :

Any Wall/ Column Seen Out of Plumb : Yes/No

If yes, mark location :

Measured Deviation :

Are there Cracks in Walls : Yes/No

Extent : Great/Some/Limited

Nature of cracks :----------

Location :----------

Size :----------

(Attach Sketches/ Photographs of Major Cracks)

Excessive deflection in Slab : Yes/No

If yes, Specify location :

Cracks in Slab : Yes/No

Nature and Extent :

Are there signs of corrosion in RC members spalling of concrete : Yes/No

Extent :

Earthquake measures adopted : Yes/No

Is there efflorescence in the building : Yes/No

III. GENERAL CONDITION & ACCEPTANCE

Access to the School : Yes/No, If Yes, Kachha/Pucca

Quality of Workmanship : Very Good/Good/ Poor

Maintenance, if any done : Yes/ No

Is the Maintenance Adequate : Yes/ No

Overall Appearance of Building : Good/ Satisfactory/ Poor

IV. TEACHERS/STUDENTS OPINION

Students Acceptance for the School :

Teachers' Opinion about the School :

V. GENERAL OBSERVATIONS OF THE SURVEY TEAM, REGARDING THE CONDITION OF BUILDING AND APPROXIMATE LIFE EXPENTANCY ETC.

VI. BUILDING SPACE AND EFFICIENCY

6.1 Enrolment and Classrooms

6.1.1 Classwise Enrolment, No. of Classrooms and students present

Class/ Enrolment during 1999 - 2000															Total Enrolment			Total Number of Classrooms
I			II			III			IV			V						
B	G	T	B	G	T	B	G	T	B	G	T	B	G	T	B	G	T	
Student present on the day of survey*																		

B = Boys, G = Girls, T= Total *Attendance register not to be used, students actually present should be recorded

6.1.2 If the number of classrooms is less than the number of classes, please depict below the seating arrangement of students.

Class Room No.	Which classes are held in this room simultaneously	No. of students accommodated in this room	Remarks
1	2	3	4
Classroom No.1			
Classroom No. 2			
Classroom No. 3			
Classroom No. 4			
Classroom No. 5			
Total			

6.2 School Building

6.2.1 Information regarding construction of School Building under OB Scheme and Non-OB Scheme.

OB DPEP Any other

Parame-ters	Entire Building	Part of the Building	Construction of Components of Building							
			Classroom No.1	Classroom No.2	Classroom No.3	Classroom No.4	Classroom No.5	Classroom No.5	Verandah	Toilets
1	2	3	4	5	6	7	8	9	10	11
Construction under OB										
Construction under DPEP										
Any Other										

6.2.2. Provide Sketch Plan, showing orientation.

Note: The door window, chalkboard etc., position with dimension should be marked in the sketch plan.

6.2.2.1 Location of School; Please Tick ( )

i) Centre of village ( )

ii) Outskirt/periphery of the village ( )

iii) In between the centre of the Village and outskirt ( )

6.2.3 Plinth Height _____ cm, Sill Height_____cm

6.2.4 Construction Agency _____

6.2.4.1

- Agency that performed construction under OB Scheme
- Year of construction

6.2.4.2

- Agency that performed construction under non-OB Scheme
- Year of construction

6.2.5 Community Involvement

Whether village community was involved in the construction of

- Additional Rooms Yes/No
- Toilets Yes/No
- Verandah Yes/No
- Complete School Building Yes/No
- Land for Playground Yes/No
- Land for School Building Yes/No

6.3 Class Rooms Data

S. No.	Components or Attributes	Classroom				
		No.1	No. 2	No. 3	No. 4	No. 5
1	2	3	4	5	6	7
1	Size (mxm)					
2	Ceiling height (m)					
3	Daylight in Classroom (Adequate/ Inadequate)					
4	Visibility of Blackboard from the last row (Adequate/ Inadequate)					
5	Problem of glare (Yes/No)					
6	Audibility to last row (Proper/Improper)					

7	Noise Problem (Yes/No)					
8	No. of students accommodated in the classrooms					
9	Citing of windows 9.1 Number 9. 2 Dimension					
10	Citing of Doors 10.1 Number 10.2 Dimension					
11	Position of Chalkboard (To be marked in the plan)					
12	12.1 Fans (Yes/No) 12.2 No. of Fans					
13	1.1 Lighting through electricity (Yes/No) 1.2 No. of lights					
14	General condition of (fittings/fixtures)					
15	Seating Arrangement (Squatting/Furniture)					
16	Type of furniture used 16.1 Chair (Wooden/steel) 16.2 Bench (Wooden/steel) 16.3 Desk (Wooden/steel)					
17	Storage space in classroom 17.1 Inbuilt storage space in classroom 17.2 If inbuilt storage space is available, is it adequate or inadequate? 17.3 If inbuilt storage space is not available, whether some Almirah etc. for storage provided in the class room (Yes/no) 17.4 If yes, whether such storage space adequate or inadequate?					

6.4 Varandah

6.4.1 Size of Varandah : --------m x ------m = -------m^2

6.4.2 Height : --------m

6.5 Toilets

Total Boys = Total Girls = Total Students =

S.No.	Item	Number	Whether Adequate or Inadequate	Remarks, if any
1	2	3	4	5
1	Toilet for Boys			
2	Toilet for Girls			

Date: **Name & Signature of Member (Survey Team)**

Note: If the School Building is not used for teaching purpose, Please specify how, it is put to use.